Addendum to the Final Environmental Impact Statement for North Bend Gravel Operation Updated Noise Analysis

for

King County Department of Development and Environmental Services

March 4, 2003

King County

Department of Development and Environmental Services
900 Oakesdale Avenue SW
Renton, WA 98055-1219

March 4, 2003

Dear Interested Reader:

An updated noise analysis has been completed for Cadman Inc.'s proposal to operate a gravel mine east of the city of North Bend. This new information adds analysis in the form of an Addendum environmental document and it has been prepared pursuant to the State Environmental Policy Act (SEPA) and Rules contained therein (WAC 197-11-600 & 706) for use by the public, agencies, and groups in review of the proposal and alternatives.

A wide variety of environmental impacts were previously evaluated in the Draft and Final Environmental Impact Statements (EIS). Additional noise analysis has been provided in response to public comments received on the Final EIS, which alleged deficiencies or inaccuracies regarding the analysis of project noise impacts. The alternatives identified in the EIS have not changed and no new significant adverse environmental impacts were identified in the update noise analysis.

The next stage in the permit review process for Cadman's grading permit application is a pending permit decision by the Department of Development and Environmental Services (DDES). There are no administrative land use hearings associated with this type of permit decision by DDES and consequently no administrative appeal process.

Please address any questions on this Addendum to: Rich Hudson, EIS Project Coordinator, King County Land Use Services Division, 900 Oakesdale Avenue SW Renton, Washington 98055-1219, phone number (206) 296-7157. All questions on the permit review should be directed to: Paul Meyer, Site Development Specialist II, King County Land Use Services Division, 900 Oakesdale Avenue SW, Renton, Washington 98055-1219, phone number (206) 296-7287.

Your involvement in the SEPA EIS process on this proposal is greatly appreciated. Thank you for your interest and participation in this environmental review.

Sincerely,

Greg Borba

Greg Borba, Current Planning Supervisor
SEPA Responsible Official

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ABBREVIATIONS AND ACRONYMS

ANSI	American National Standards Institute
dBA	A-weighted decibel scale
dB	decibel
DEIS	draft environmental impact statement
EIS	environmental impact statement
ENM	Environmental Noise Model
EPA	U.S. Environmental Protection Agency
FEIS	final environmental impact statement
FHWA	Federal Highway Administration
Hz	hertz
I-90	Interstate 90
IEEE	Institute of Electronic and Electric Engineers
Ldn	day-night sound level
Leq	equivalent sound level
Lmax	maximum sound pressure level
mph	miles per hour
SEPA	State Environmental Policy Act
SLM	sound level measurement
TNM	Transportation Noise Model
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

Executive Summary

This Addendum presents an updated noise analysis for the proposed North Bend Gravel Operation. The proposed mining would occur on two portions of the project site referred to as the "Upper Site portion" and "Lower Site portion." These two portions of the project site are a single, contiguous site for permitting purposes. This analysis was conducted in response to post EIS comments regarding the noise analysis that was provided in the Final Environmental Impact Statement (FEIS).

The updated noise analysis includes a number of modifications to the previous FEIS modeling data and to the criteria used in the evaluation of significant impacts. These modifications were made in order to provide a more accurate prediction of future noise levels and potential noise impacts from the proposed North Bend Gravel Operation. The results discussed in this Addendum differ somewhat from the results included in the FEIS. A list of the most noteworthy modifications follows:

- Revisions to the Environmental Noise Model (ENM) input data including the maps and receptor information
- Revisions to the equipment sound level data used in ENM, including the use of equipment sound power levels instead of sound pressure levels for the representative equipment
- Revisions to the meteorological conditions used in ENM
  - The "Calm" scenario in the addendum includes a slightly lapse atmosphere (-1 °C/100 meters) with no wind.
  - The "Inversion" scenario in the addendum is a temperature inversion (+3 °C/100 meters) with no wind.
  - The "Wind" scenario in the addendum includes a slightly lapse atmosphere (-1 °C/100 meters) with a 3 meter/second (6.7 miles per hour) wind blowing from the two predominant wind directions in the project vicinity, the southeast and the north-northwest.
- Inclusion of an analysis of noise from onsite equipment and trucks during Phase 2 of Alternatives 2 and 3
- Revisions to Traffic Noise Model (TNM) maps and receptor locations for predicting both the onsite and offsite truck noise
- Use of the most current grading plans for the Lower Site
- Consideration of the U. S. Environmental Protection Agency EPA Region X noise impact guidelines published in 1973

- Analysis regarding the inappropriateness of using the EPA Region X noise impact guidelines to define noise impacts due to sound level increases at locations with impermanent, non-residential uses
- Inclusion of Federal Highway Administration (FHWA)/Washington State Department of Transportation (WSDOT) noise criteria for determining offsite traffic noise impacts

While the predicted noise levels and the criteria for assessing noise impacts discussed in this addendum differ from those presented in the FEIS, the overall projected impacts due to project-related noise sources remain similar.

Predicted Noise Levels from Onsite Activities

A brief summary of the differences and overall conclusions regarding the predicted noise from onsite activities and equipment is presented in Table ES-1 and is discussed following the table.

Table ES-1
Comparison of the Number of Comparable FEIS and Addendum Locations where Predicted Sound Levels Exceed the King County Noise Limits

	Phase 1	Alternative 2, Phase 2			Alternative 2, Phase 8			Alternative 3			Alternative 4		
	Calm	Calm	Inversion	Wind	Calm	Inversion	Wind	Calm	Inversion	Wind	Calm	Inversion	Wind
FEIS Locations Exceeding KC Limits	0	NA	NA	NA	0/0	0/4	2/6	0/0	0/0	0/3	0	0	0
Addendum Locations Exceeding KC Limits	0	0/1	0/2	0/7	0/3	0/3	1/10	0/0	0/0	1/4	0	0	0

The occurrences of predicted sound levels exceeding the King County noise limits are presented as Day/Night where daytime occurrences are between 7 a.m. to 10 p.m. and nighttime occurrences are between 5 a.m. and 7 a.m. Phase 1 (i.e., construction) activities and operations with Alternative 4 would be restricted to daytime hours (7 a.m. to 10 p.m.), and only daytime exceedances would occur.

KC – King County
NA- Not Analyzed
"Calm" conditions are compared to the "Typical" scenario presented in the FEIS
"Inversion" conditions are compared to the "Inversion" scenario presented in the FEIS
"Wind" conditions are compared to the "High Winds" scenario presented in the FEIS

In some instances, the predicted onsite equipment sound levels at individual receptor locations differed from the FEIS by more than 10 A-weighted decibels (dBA), and sometimes by more than 20 dBA. Although the sound levels were different, as shown in Table ES-1, the frequency of the exceedances was similar for the FEIS. The noise analysis presented in this Addendum and the overall identified impacts remain similar.

The Addendum concluded construction noise during Phase 1 under Alternatives 2 or 3 could affect residential locations near the Lower Site.

Predicted sound levels in the updated noise analysis easily meet King County's construction noise limits during daytime hours, which are equivalent to the King County's operation noise limits plus 25 dBA. Therefore, no significant noise impacts from construction activities are anticipated.

During Phase 2 of Alternative 2, the predicted sound levels from onsite excavation equipment and trucks fall below King County's daytime noise limits, and are generally much lower than the allowed limits. Predicted sound levels during early morning operations between 5 and 7 a.m., however, exceed the county's nighttime limits at several receptor locations, particularly during adverse meteorological conditions.

During full operation of both the Upper and Lower Site portions in Phase 8 of Alternative 2, predicted sound levels from onsite equipment and trucks, will fall far below the King County's daytime noise limits during calm and inversion conditions. With a light wind blowing from the southeast, the predicted sound level at one property line location exceeds the county's daytime noise limit. Predicted sound levels during early morning operations between 5 and 7 a.m. exceed the County's nighttime limits at several receptor locations, particularly during adverse meteorological conditions.

With Alternative 3, both the FEIS and the Addendum show that the predicted sound levels from onsite equipment and trucks fall far below King County's daytime noise limits during calm and inversion conditions. With a light wind blowing from the southeast, the predicted sound level at one property line location north of the Lower Site portion exceeds the King County's daytime noise limit. Predicted sound levels during early morning operations between 5 and 7 a.m. exceed the King County's nighttime limits at several receptor locations north of the Lower Site portion with a southeasterly wind.

With Alternative 4, both the FEIS and the Addendum show that the predicted sound levels from onsite equipment and trucks fall far below King County's daytime noise limits at all receptor locations. Under this alternative, there would be no early morning operations prior to 7 a.m.

Predicted Noise Levels from Offsite Traffic

Both the FEIS and the updated noise analyses show that potential noise impacts from offsite traffic would be likely at three locations, namely the Edgewick Inn, Olallie State Park, and the Washington State Patrol Fire Training Academy.

At the Edgewick Inn, both the FEIS and the Addendum presented relatively high predicted exterior traffic noise levels in the future without the project and with Alternative 2. The FEIS evaluated the significance of a traffic noise impact at the Edgewick Inn based on an increase in offsite traffic noise due to the project, and concluded that the project would not result in a significant noise impact at the inn. While the Addendum asserts that the

increase over existing levels is not a significant impact at the Edgewick Inn, given the primary use is by non-permanent clientele, predicted noise from project-related trucks would dominate the future predicted sound levels, and this source should not be discounted. Because there is little exterior use at the Edgewick Inn, traffic noise impacts at the Inn were based on the overall interior sound levels affecting the primary and most sensitive use of the rooms, namely sleeping. After considering the measured exterior to interior sound level reduction of 27 dBA, the predicted interior sound levels at the most-affected northerly rooms of the inn were 45 dBA with full operation in 2025. An interior sound level of 45 dBA or less should be protective of sleep. Therefore, no significant noise impacts from offsite traffic noise were identified at the Edgewick Inn with Alternative 2. Traffic noise impacts with Alternative 3 would be slightly lower than with Alternative 2, and traffic noise from Alternative 4 would not affect the Edgewick Inn.

No offsite traffic noise impacts at Olallie State Park were identified in either the FEIS or the Addendum with Alternative 2. At Olallie State Park, both the FEIS and the Addendum predicted future traffic noise levels with Alternatives 3 and 4 of 63 dBA. The FEIS indicated that, due to a predicted increase of 13 dBA due to the project, significant traffic noise impacts would be expected under either of these alternatives. The Addendum presents an analysis showing an increase of 7 dBA, but asserts that the park is not a permanent residential use and that increases over existing levels have less impact consideration at this location and therefore have less than a significant impact. Instead, the overall sound level should be considered. According to the FHWA criterion for parks, an exterior traffic sound level of 63 dBA would not be considered a significant noise impact.

No offsite traffic noise impacts were identified in either the FEIS or the Addendum with Alternative 2. At the Washington State Patrol Fire Training Academy, with respect to Alternatives 3 and 4, the FEIS predicted traffic sound levels of 61 dBA. While the Addendum shows levels at 67 to 68 dBA. The FEIS indicated that significant noise impacts would be expected due to predicted increases of 11 dBA over background sound levels. However, similar to the Edgewick Inn and Olallie State Park, the Fire Training Academy has no permanent residents and an increase in traffic noise is not determined to be a significant noise impact. Again, the overall sound level should be used in the consideration of impacts at this location. The predicted sound level in the Addendum of 67 to 68 dBA would be considered an impact using FHWA noise impact criteria for exterior locations, and both the FEIS and Addendum identified significant adverse noise impacts at this location.

Conclusion

Although there are differences between the results presented in the FEIS and the Addendum, the overall conclusions regarding the nature and significance of noise impacts remain similar for all Alternatives. Noise from onsite equipment for all alternatives would generally meet the King County

noise limits during daytime hours. With Alternatives 2 and 3, predictions of nighttime operational noise between 5 and 7 a.m. exceed the King County nighttime noise limits at up to 10 receptor locations. The predicted sound levels at up to 3 receptor locations exceed King County nighttime noise limits under the calm or inversion scenarios. Mitigation measures discussed in the Addendum include implementation of a noise monitoring plan and restrictions on early morning operations until noise monitoring has indicated that the operation can meet the more stringent nighttime noise limits. Under each of the Alternatives with successful implementation of these mitigation measures, no unavoidable significant adverse noise impacts are anticipated due to onsite equipment and trucks.

Regarding offsite traffic noise, no significant impacts were identified with Alternative 2. Significant unavoidable adverse noise impacts are expected only at the Fire Training Academy under Alternatives 3 and 4.

1.0 Introduction

Cadman, Inc., has applied to King County for permits to start aggregate mining and processing operations at a site approximately 30 miles east of Seattle, near the town of North Bend. The proposed mining would occur on two portions of the project site referred to as the "Upper Site portion" and "Lower Site portion." These two portions of the project site, connected by an operational easement that was retained as part of Weyerhaeuser Company's conveyance of intervening parcels pursuant to the 1998 Middle Fork/Grouse Ridge Memorandum of Understanding (MOU), are a single, contiguous site for permitting purposes.

Cadman has proposed that mining and processing operations at the Lower Site portion would occur from 5 a.m. to 10 p.m. Monday through Saturday, with truck loading and hauling to occur 24 hours per day. At the Upper Site portion, operating hours would be from 7 a.m. to 5 p.m. Monday through Friday, with maintenance only on Saturday from 7 a.m. to 3 p.m.

This updated noise analysis is intended to address comments on the noise chapter of the *Final Environmental Impact Statement* (FEIS) and the Noise Technical Report, which was included as Appendix D of the FEIS (King County 2001). The updated noise analysis includes a number of modifications to the previous FEIS modeling data and to the criteria used in the evaluation of significant impacts. These modifications were made in order to provide a more accurate prediction of future noise levels and potential noise impacts from the proposed North Bend Gravel Operation. The material is organized by topic, in the same order as the FEIS, starting with issues regarding existing conditions and followed by a discussion of project impacts and mitigation measures.

Modifications of Assumptions Used in DEIS and FEIS

The updated noise analysis includes modifications to the previous draft EIS (DEIS) and FEIS modeling data and to the criteria used in the evaluation of significant impacts. These modifications were made in order to provide a more accurate prediction of future noise levels and potential noise impacts from the proposed North Bend Gravel Operation. Based on these modifications, the results discussed in the following text differ from the results included in the FEIS. Discussions of the most noteworthy modifications follow.

Revisions to ENM Maps

The Environmental Noise Model (ENM) topographic maps used in the updated noise analysis corrected some errors and were more detailed than the topographic maps used for the FEIS analysis. The updated analysis utilized a single topographic map encompassing the entire project vicinity,

including both the Upper and Lower Site portions, for modeling all onsite noise sources at all offsite receptor locations. The FEIS analysis had split the Upper and Lower Site portions and conducted only noise modeling at those receptor locations assumed to be affected by sources from the Upper Site portion or Lower Site portion, not both. The updated analysis methodology resulted in fewer predicted sound levels of 0 A-weighted decibels (dBA) at more distant receptor locations.

Revisions to ENM Receptors

The receptor location heights used in the updated analysis were placed at 5 feet above ground elevation, a standard listening height used in noise modeling. Also, in order to simplify the tables and discussion of potential impacts, fewer receptor locations were included in the updated noise modeling than in the FEIS modeling. The updated analysis removed several receptors north of the site that did not represent sensitive receivers, used fewer north property line locations, and consolidated the residential receptor locations south of Interstate 90 (I-90). The receptor locations were consolidated to simplify the reporting and understanding of the updated noise analysis, and the locations chosen for the updated noise analysis still fully identify potential impacts on offsite receptors.

Revisions to ENM Sources

In the FEIS analysis, the loaders, dozers, and scrapers were defined in the ENM as line sources. Such sources working as they typically do are more appropriately represented as point sources that could operate in several different locations. To assess potential noise impacts from mobile equipment, several point source locations for each piece of equipment were modeled. As a reasonable worst-case analysis, it was assumed that the equipment could work in each location for an hour-long period, and the highest predicted sound level of all of the locations modeled was used to calculate the overall noise levels.

Unlike the mobile equipment, the conveyor is a true line source. However, the ENM cannot consider varying topographical features along a line source. Therefore, the preferred method for analyzing such sources using the ENM is to break long line sources into multiple point sources or into a series of smaller line sources representing similar areas of terrain. This is the best way to accurately consider such sources in this model, and the updated analysis considered conveyor noise using this technique.

In addition to characterizing the sources in the ENM as point sources, the updated analysis modified the equipment sound level data used in ENM. First, the equipment sound pressure levels were converted to equipment sound power levels, as is required by the model. Second, the updated analysis used different sound level measurement information for most of the anticipated onsite equipment because many of the source sound levels measured for the previous FEIS analysis either included incomplete

frequency information or fell outside the expected range of equipment source noise.

Revisions to Meteorological Conditions Used in ENM

The ENM used to predict sound levels from onsite equipment and activities at offsite receptors allows the user to calculate sound levels for reasonable meteorological conditions. This updated noise analysis employed modified meteorological conditions as follows:

1. The "Typical" scenario in the FEIS included a slightly lapse atmosphere (–1°C/100 meters) with a 2.2-mile-per-hour (mph) wind from the south. By including a wind blowing only from the south, the FEIS "Typical" scenario would have predicted reduced sound levels at locations upwind of the Lower or Upper Site portions. Also, a wind blowing from due south is uncommon in the project area. Therefore, the updated analysis uses a slightly lapse atmosphere (–1 °C/100 meters) with no wind and refers to it as the "Calm" scenario. This scenario would be considered favorable from a noise impact perspective, because the meteorological conditions would not result in an increase in project noise at distant locations.

2. The "Inversion" scenario in the FEIS included an extreme temperature inversion (+4 °C/100 meters) coupled with a southerly wind of approximately 6.7 mph. A temperature inversion of +4 °C/100 meters is extreme and uncommon in this region, and this updated analysis uses a more reasonable worst-case temperature inversion of +3 °C/100 meters, which is still a strong inversion. No wind was included in the "Inversion" scenario in this updated analysis because a strong temperature inversion cannot coexist with winds greater than approximately 4 mph.[1] This scenario would be considered adverse from a noise impact perspective, resulting in elevated project sound levels at distant locations.

3. The "High Winds" scenario in the FEIS included very strong winds (22 mph) blowing only from the east-southeast. This updated analysis studied 6.7 mph winds blowing from both the southeast and the north-northwest in order to characterize downwind conditions for the residences north and south of the Lower Site portion, and because the two predominant wind directions in the project vicinity are from the southeast and from the north-northwest. This updated analysis calls this the "Wind" scenario, and this scenario would represent a reasonable worst-case condition. Although wind speeds greater than 6.7 mph are common in the project vicinity, higher wind speeds were not considered for the following reasons:

- Sound levels of distant noise sources grow increasingly difficult to accurately measure at higher wind speeds. This is due to both the

[1] Dr. Bart Brashers, Atmospheric Scientist, personal conversation, February 2003.

increase in background sound levels (including noise *caused* by the wind such as the rustling of trees and vegetation) and to the fluctuation of the wind direction and speed. For this reason, WAC 173-58-040 restricts the use of sound measurements (other than close proximity measurements) during periods with wind speeds higher than 12 mph.

- From a noise impact standpoint, the conditions identifying the highest *impacts* should be identified, not the maximum possible wind speed. Wind speeds of 22 mph would not provide the greatest indication of noise impact from the proposed project because such winds would substantially increase background sound levels (including noise *caused* by the wind such as the rustling of trees and vegetation), which could mask pit noise. Thus, the wind speeds examined with modeling were restricted to 6.7 mph to assess the greatest impact from the project, i.e., the largest potential increase in project levels without an undue increase in background levels.[2]

- Higher wind speeds tend to result in greater atmospheric turbulence and incoherence, resulting in more fluctuation of sound levels over an extended period of time (i.e., an hour).

- Initial modeling of the project noise sources using the ENM and a wind speed of 12 mph resulted in unreasonably large predicted sound level increases compared to calm conditions, greater than 30 dBA in some cases and generally greater than 20 dBA at downwind locations. Sound level increases of this magnitude due to meteorological conditions are uncommon and would not constitute a "reasonable worst-case scenario" as required by the State Environmental Policy Act (SEPA). Although the predicted increases using a wind speed of 6.7 mph still exceed 20 dBA at a few locations and are as high as 30 dBA at two very distant locations, increases of this magnitude occurred at relatively few locations, and most of the increases at receptors downwind of the sources were in the mid-teens. These results suggest that this scenario is a better representation of a worst-case scenario.

Revisions to TNM Maps and Receptor Locations

Similar to the ENM maps, the Transportation Noise Model (TNM) topographic maps used in the updated noise analysis corrected some errors and were more detailed than the topographic maps used for the FEIS analysis. A single topographic map was used to consider all onsite trucks from both the Upper and Lower Site portions. Similarly, a single topographic map was used to model all of the offsite roadways, including I-90 from west of Exit 34 to east of Exit 38, the local roadways and freeway on and off-ramps near Exit 34, and the access road to the Upper Site portion. The receptor locations used for the TNM modeling were the same as those

[2] The 6.7 mph speed was suggested by Dr. Renzo Tonin, the developer of the Environmental Noise Model, to represent a reasonable worst-case condition. (Tonin, personal communication, October 1995.)

used for the ENM modeling, with the addition of one receptor location representing the northernmost rooms at the Edgewick Inn.

Revision to Edgewick Inn TNM Receptor Location

The updated noise analysis considers potential offsite traffic noise impacts at the rooms of the Edgewick Inn most likely to be affected by project-related traffic noise, namely the four northernmost rooms facing SE 146th Street. The FEIS analysis of offsite traffic noise at the Edgewick Inn did not measure the noise levels at these rooms nearest to SE 146th Street. Also, sound level measurements were taken to quantify the exterior to interior noise reduction in the northern rooms in order to determine interior sound levels with the project in the future.

EPA Region X Noise Impact Guidelines

The noise impact analysis in the DEIS and FEIS made use of what were called either the U.S. Environmental Protection Agency (EPA) Region X draft guidelines or the "federal guidelines." These draft guidelines classified a sound level increase of 0 to 5 dBA as a "slight" impact, an increase of 5 to 10 dBA as a "significant" impact, and an increase of more than 10 dBA as a "very serious" impact. However, these draft guidelines are insufficiently documented to be cited as a credible and authoritative reference in this matter, and there is no indication that they were ever adopted or finalized. Furthermore, the EPA Region X memorandum did not define the noise metric(s) upon which these increases would be measured (e.g., an hourly equivalent sound level [L_{eq}], day-night sound [Ldn] level, or some other metric). For these reasons, the characterization of a 5 to 10-dBA noise increase as a "significant" impact and a greater than 10-dBA noise increase as a "very serious" impact should not be made based on reference to these draft guidelines. However, a document published by the EPA Region X office in April 1973 titled "Environmental Impact Statement Guidelines" discusses noise increases in relation to expected community response to the introduced noise source. The updated noise analysis reported here relies on the published April 1973 version of the EPA Region X guidelines, which are discussed in Section 2.2.1.

Inclusion of FHWA/WSDOT Noise Criteria

The updated noise analysis includes a discussion of the Federal Highway Administration/Washington State Department of Transportation (FHWA/WSDOT) noise criteria for offsite traffic noise. The proposed project is exempt from these criteria, but they are a useful tool for discussing potential offsite traffic noise impacts, given that the King County noise ordinance exempts traffic traveling on public roadways from the County noise limits. These criteria are discussed in Section 2.2.1.

Used Most Current Grading Plans for Lower Site Portion

The updated noise analysis used the most recent grading plans provided to the County in January 2003 for the most up-to-date and detailed topographic information for the Lower Site portion.

2.0 Existing Conditions

2.1 Definition of Noise and How It Is Measured

The human ear responds to a very wide range of sound intensities. The decibel (dB) scale used to describe sound is a logarithmic rating system that accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dB. Therefore, a 70-dB sound level will sound twice as loud as a 60-dB sound level.

People generally cannot detect sound level differences (increases or decreases) of 1 dB in a given noise source. Although differences of 2 or 3 dB can be detected under ideal laboratory situations, they are difficult to discern in an active outdoor noise environment. A 5-dB change in a given noise source would be expected to be perceived under normal listening conditions.

Because the dB scale used to describe noise is logarithmic, a *doubling* of a *noise source* (i.e., twice as many pieces of the same equipment) produces a 3-dB increase in average source noise. Average sound levels due to line sources such as heavy traffic decrease with distance from the road at a rate of 3 dB per doubling of the distance from the road. Peak sound levels from discrete events or point sources, such as from a material processing plant, decrease at 6 dB per doubling of the distance from the plant. Conversely, moving half the distance closer to the source increases sound levels by 3 dB and 6 dB for line and point sources, respectively.

When addressing the effects of noise on people, it is necessary to consider the frequency response of the human ear. Sound measuring instruments are, therefore, often designed to respond to or ignore certain frequencies. The frequency weighting most often used to evaluate environmental noise is A-weighting, and measurements from instruments using this system are reported in "A-weighted decibels" or dBA. All sound levels discussed in this evaluation are reported in A-weighted decibels.

For a given noise source, factors affecting the sound transmission from the source, which affect the potential noise impact, include distance from a source, frequency of the sound, absorbency of the ground surface, the presence or absence of obstructions and their absorbency or reflectivity, and the duration of the sound. The degree of impact on humans also depends

on who is listening and on existing sound levels. Typical sound levels of some familiar noise sources and activities are presented in Table 1.

Table 1
A-Weighted Sound Levels and Human Response

Sound Source	dBA	Range of Human Response
Aircraft carrier operation	140	
Jet takeoff (at 200 feet)	120	Painfully loud
Riveting machine	110	Maximum vocal effort
Shout (at 0.5 foot)	100	
Heavy truck (at 50 feet)	90	
Busy street	80	Hearing damage with continuous exposure
Freeway traffic (at 50 feet)	70	Telephone use difficult
Air conditioning unit (at 20 feet)	60	
Light auto traffic	50	Quiet
Bedroom, library	40	
Soft whisper	30	Very quiet
Broadcasting studio	20	
Undefinable	10	Just audible
Undefinable	0	Threshold of hearing

Note:
dBA - A-weighted decibel

Source: U.S. Council on Environmental Quality

2.2 Regulation of Noise

Relevant noise criteria for this evaluation include the King County noise ordinance and noise guidelines established by federal agencies. Federal regulatory agencies often use the equivalent sound level (L_{eq}) and the day-night sound level (L_{dn}) to evaluate noise impacts. The equivalent sound level is the level of a constant sound that has the same sound energy as the actual fluctuating sound. When using L_{eq}, it is important to identify the time period being considered. $L_{eq}(24)$, for example, is the equivalent sound level for a 24-hour period. The L_{dn} is similar to the $L_{eq}(24)$ except that a 10-dBA penalty is added to the hourly L_{eq}s between 10 p.m. and 7 a.m. to account for sleep interference.

2.2.1 Environmental Protection Agency Region X

As discussed previously, the "EPA Region X guidelines" used in the DEIS and FEIS to discuss potential noise impacts due to increases over the background sound levels are insufficiently documented to be considered authoritative. Instead, this analysis uses the guidelines presented in the published version of the EPA Region X document titled "Environmental Impact Statement Guidelines." (EPA Region X, 1973.) In the published

document, increases in noise are discussed in relation to expected community response to the introduced noise source. The responses are described as follows:

- Up to 5-dBA increase—few complaints if gradual increase
- 5- to 10-dBA increase—more complaints, especially if conflict with sleeping hours
- over 10-dBA increase—substantial number of complaints

According to the published Region X document, generally no mitigation is required if the increase is less than 5 dBA. Some mitigation should be considered for increases of 5 to 10 dBA. Increases greater than 10 dBA would be considered serious and would warrant close attention. The EPA guidelines are not standards and do not have the force of law, but do serve as useful indicators for potential noise impacts of projects undergoing SEPA review. The published 1973 document does not indicate either the time interval (e.g., hourly or daily) or the noise metric (e.g., L_{eq} or maximum sound pressure level [L_{max}]) to which these impact/mitigation thresholds should be applied. Therefore, these guideline recommendations are applied in this updated noise analysis to the predicted cumulative *hourly* levels (L_{eq}/L_{25}) with some reservations as to their usefulness and applicability.

2.2.2 FHWA and WSDOT

The FHWA has adopted noise standards that apply to traffic noise associated with its projects. *These standards do not apply to this project* because they are intended for use along roads controlled by state or federal agencies that are being structurally altered by a project or action. However, the FHWA traffic noise limits and the Washington State implementation of these rules through state policies are discussed below to provide a perspective on the noise levels discussed.

The FHWA identified noise criteria and established procedures for evaluating road improvement projects in its Federal-Aid Highway Manual (U.S. Department of Transportation, 1982). The FHWA defines a traffic noise impact as a predicted traffic noise level approaching or exceeding the noise abatement criteria in Table 2 or substantially exceeding the existing noise level. The FHWA leaves the definition of "approach" to the states. WSDOT defines "approaching" the FHWA limits as sound levels within 1 dBA of the criterion level. WSDOT defines "substantially exceeding" existing noise levels as an increase of 10 dBA or more if the calculated future sound level is greater than 50 dBA.

Table 2
FHWA Roadway Noise Abatement Criteria

	Land Use Category	Hourly L_{eq} (dBA)
(A)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose	57 (exterior)
(B)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals	67 (exterior)
(C)	Developed lands, properties, or activities not included in the above categories	72 (exterior)
(D)	Undeveloped lands	------
(E)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums	52 (interior)

Notes:
dBA - A-weighted decibels
FHWA - Federal Highway Administration
Leq - equivalent sound level

Source: Federal noise rules in 23 CFR 772

2.2.3 State and Local Regulations

Relevant noise criteria for this evaluation are included in the King County Code Chapters 12.86 - 12.100. The County code establishes limits on the levels and durations of noise crossing property boundaries. Allowable maximum sound levels depend on the district (land use zone) of the source of the noise and the district (land use zone) of the receiving property when both are located in King County (see Table 3). The maximum permissible levels are the limits a source can generate at its boundary with other land uses, not the total of the project and background sound levels.

King County's noise criteria can be exceeded for certain periods of time: 5 dBA for no more than 15 minutes of any hour, 10 dBA for no more than 5 minutes of any hour, or 15 dBA for no more than 1.5 minutes of any hour. Sometimes these exceptions are described in terms of the percentage of time a certain level is exceeded. For example, L_{25} represents a sound level that is exceeded 25 percent of the time, or 15 minutes in an hour. Similarly, $L_{8.33}$ and $L_{2.5}$ are the sound levels that are exceeded 5 and 1.5 minutes in an hour, respectively. At no time can the allowable sound level be exceeded by more than 15 dBA.

Table 3
King County Maximum Permissible Sound Levels

Zoning District of Noise Source	Zoning District of Receiving Property			
	Rural Day/Night	Residential Day/Night	Commercial	Industrial
Rural	49/39	52/42	55	57
Residential	52/42	55/45	57	60
Commercial	55/45	57/47	60	65
Industrial	57/47	60/50	65	70

Note: King County defines daytime hours as 7 a.m. to 10 p.m. weekdays and 9 a.m. to 10 p.m. weekends and holidays. Nighttime hours are 10 p.m. to 7 a.m. weekdays and 10 p.m. to 9 a.m. weekends and holidays.

Source: King County Code Chapter 12.88.020

King County's noise code identifies a number of noise sources or activities that are exempt from the maximum permissible sound levels described previously. The following sources are among those exempt from the levels specified in Chapter 12.88 of the King County Code:

- Sounds created by motor vehicles on public roads. Maximum permissible sound levels from **individual** motor vehicles are regulated by Chapter 12.90.010 of the King County Code.

- Sounds created by warning devices (such as backup alarms on vehicles) when not operated continuously for more than 30 minutes per incident.

King County's noise rules include specific limits on construction noise that vary with the types of sounds being generated. The maximum permissible sound levels specified in King County Code Chapters 12.88.020A and 12.88.030 and shown in Table 3 may be exceeded as measured at the real property of another person or 50 feet from the equipment, whichever is greater, between 7 a.m. and 10 p.m. on weekdays and between 9 a.m. and 10 p.m. on weekends, by no more than:

- Twenty-five dBA for equipment used on construction sites, including crawlers, tractors, bulldozers, rotary drills and augers, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors, and pneumatic-powered equipment

- Twenty dBA for portable powered equipment used in temporary locations in support of construction activities or used in the maintenance of public facilities, including chainsaws, log chippers, lawn and garden maintenance equipment, and powered hand tools

- Fifteen dBA for powered equipment used in temporary or periodic maintenance or repair of the grounds or appurtenances of any property, including lawnmowers, powered hand tools, snow-removal equipment, and composters

2.3 Zoning and Land Uses

King County is the authority responsible for planning and zoning on the project site and its immediate vicinity. Land uses in the project vicinity include residential, commercial, industrial, forestry, and recreational. The areas most likely to be noise sensitive are the residential properties north and south of the Upper and/or Lower Site portions, the Mine Creek Campground northwest of the Upper Site portion, the Washington State Patrol Fire Training Academy east of the Upper Site portion, and Olallie State Park near one of the alternative access roads to the Upper Site portion.

Both the Upper and Lower Site portions of the proposed North Bend Gravel Operation are located on land zoned for forestry and are identified in the King County Comprehensive Plan Mineral Resources Map as "Potential Surface Mineral Resource Sites." Therefore, the mineral extraction operation would be considered an industrial noise source affecting nearby receiving properties.

The residential properties closest to the Lower Site portion are located north and south of the Lower Site portion. They are zoned for rural-residential uses and would be considered "Rural" receiving properties.

The Wood River Community is located northwest of the Lower Site portion, within the limits of the North Bend Urban Growth Boundary. It is zoned for residential uses and would be considered a "Residential" receiving property.

The Edgewick Inn, the Seattle Truck Town East, and the other businesses along 468th Avenue SE are located on property zoned for commercial uses and would be considered "Commercial" receiving properties.

The residences north of the Upper Site portion, the Mine Creek Campground, the Washington State Patrol Fire Training Academy, and Olallie State Park are all on property zoned for forestry and would be considered "Rural" receiving properties.

2.4 Existing Noise Levels

Sound level measurements were taken as part of the noise analysis included in the DEIS and FEIS. These included 24-hour sound level measurements at numerous locations in the site vicinity used to characterize the existing noise environment. The measurements were taken with Larson-Davis Models 812 and 814 sound level meters. These sound level meters and microphones conform to Institute of Electronic and Electric Engineers (IEEE)

and American National Standards Institute (ANSI) standards for Type 1 instruments. All meters had been calibrated within the last 12 months.

Eight 24-hour measurements were taken at seven locations determined to be most likely to be affected by project-generated noise. Measurements were made on 2 consecutive days, with one site monitored on both days to serve as a point of comparison.

Winds during the measurements were generally southerly and light, and there were periods of light rain during the 2 days of monitoring. In addition to the 24-hour sound level measurements, a short-term measurement of local traffic noise was taken at Olallie State Park. The sound level measurement (SLM) locations are shown in Figure 1; the measurement results are summarized in Table 4. Hourly details are provided in Appendix A.

The North Bend area adjacent to the proposed project site currently receives noise from a variety of sources, with freeway traffic being the major source. Noise from the long westbound descent of I-90 into North Bend was noticeable at all measurement sites. Local truck and passenger car traffic was noticeable at SLM locations 2 (Wood River Community residential area) and 4 (potential school site).

Table 4
Range of Measured Noise Levels (in dBA)

SLM Location	Date	Daytime Leqs			Nighttime Leqs			Ldn
		Average	High	Low	Average	High	Low	
1	3/17/99	50	55	47	47	49	45	54
2	3/17/99	52	56	49	49	51	46	56
3	3/17/99	46	53	41	43	47	40	51
4	3/17/99	53	57	50	50	57	47	58
5	3/18/99	48	53	44	41	46	39	50
6	3/18/99	51	55	49	47	50	45	55
7	3/18/99	52	57	47	48	51	43	56
8	3/18/99	58	61	55	57	59	57	64
9	12/14/99	56	N/A					

Notes:

Daytime hours in this table are defined as 7 a.m. to 10 p.m. and nighttime hours as 10 p.m. to 7 a.m.
Leq - equivalent sound level
Ldn - day-night sound level
SLM - sound level measurement

SLM1: Started on 3/17/99 at 1 p.m. Located adjacent to SW corner of Lu residence approximately 17 feet south of SW corner S18 T23N R93.

SLM2: Started on 3/17/99 at 1 p.m. Located adjacent to SE corner of Wood River, approximately 95 feet north of SE Middle Fork Road.

SLM3: Started on 3/17/99 at 1 p.m. Located on east property line of 14110 475th Avenue SE, approximately 230 feet east of south end of 475th Avenue SE.

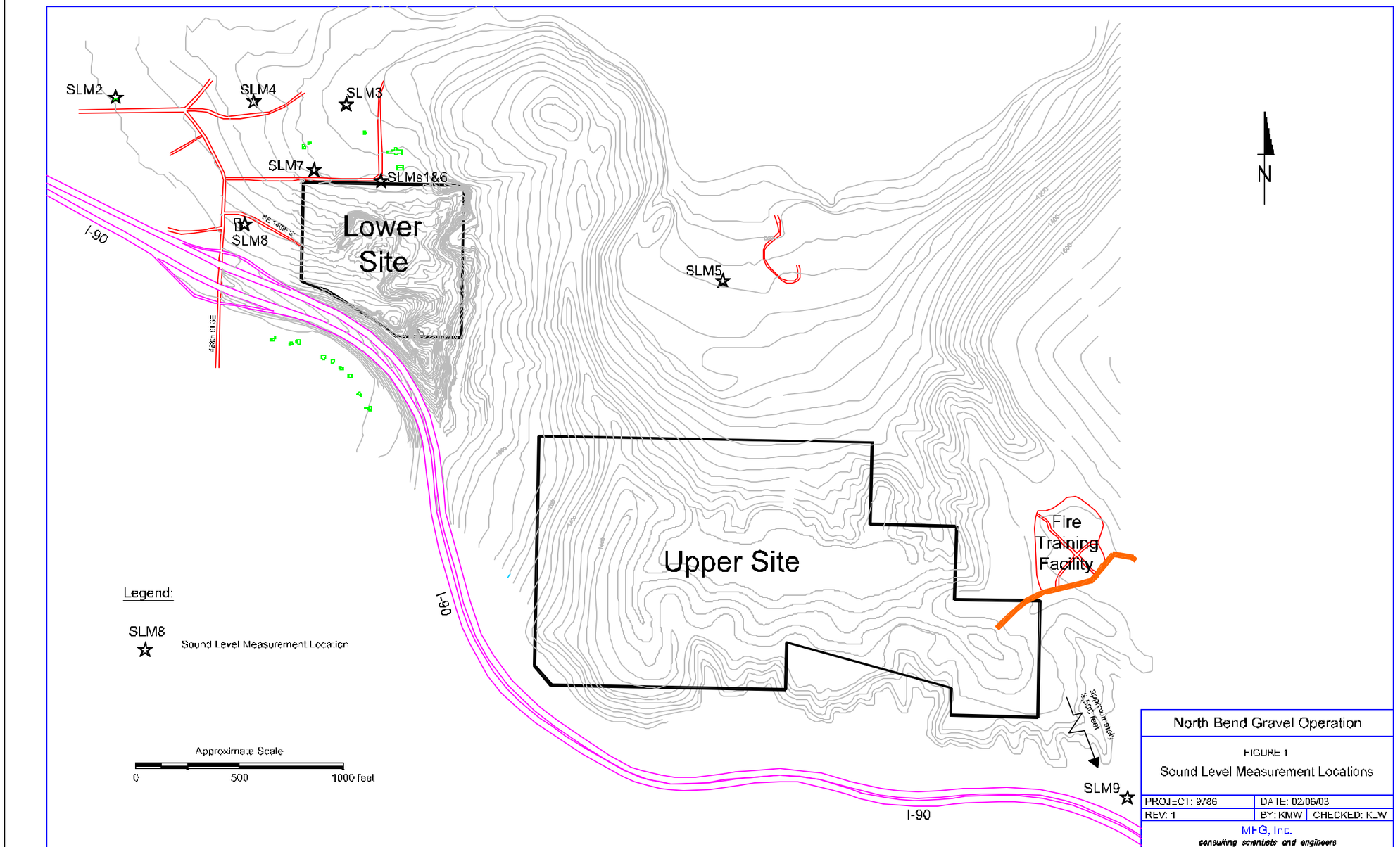

Figure 1. Sound Level Measurement Locations

Table 4 (Continued)
Range of Measured Noise Levels (in dBA)

SLM4: Started on 3/17/99 at 1 p.m. Located on potential new school site at Lake Dorothy Road, approximately 60 feet north of and 270 feet east of SE Middle Fork Road.

SLM5: Started on 3/18/99 at 2:45 p.m. Located at 49211 SE Middle Fork Road, approximately 20 feet south of and 500 feet east of Middle Fork Road in the 49200 block.

SLM6: Started on 3/18/99 at 2:45 p.m. Same location as SLM1.

SLM7: Started on 3/18/99 at 2:45 p.m. Located on 47230 SE 144th Street, approximately 60 feet north of SE 144th Street and 30 feet west of driveway to 47230.

SLM8: Started on 3/18/99 at 2:45 p.m. Located near the NE property line of the Edgewick Inn, approximately 45 feet south of the edge of SE 146th Street.

SLM9: Started on 12/14/99 at 11 a.m. Located in Olallie State Park, approximately 60 feet north of SE Grouse Ridge Road. Measurement lasted approximately 30 minutes.

Source: Sound level measurements by Environalysis, Inc.

3.0 Environmental Impacts

Noise impacts related to the proposed North Bend Gravel Operation could result from construction activities, future mining and processing activities, and truck trips on the project site and on local roadways.

Noise generated by construction, excavation, and processing equipment was evaluated using the ENM. The ENM is a computer program that allows entry of detailed information on the acoustical characteristics of noise sources, intervening topography (including barriers and structures), and meteorological conditions. The ENM computes noise levels at selected receiver locations based on the above inputs and noise calculation techniques. First, the noise sources are characterized by measurements of representative equipment. Next, three-dimensional maps of the site and vicinity are created to enable the ENM model to evaluate effects of distance and topography on noise attenuation, and the equipment sound power levels are assigned to the appropriate locations on the quarry site. The ENM then constructs topographic cross sections to evaluate noise impacts in the vicinity of the project site.

As discussed previously, the ENM allows the user to calculate sound levels for reasonable meteorological conditions. In the evaluation of the individual receiving locations, three meteorological conditions were considered. The first meteorological scenario, termed a "calm" atmospheric condition in this report, is a fairly common daytime condition consisting of calm conditions (i.e., no wind) and a neutral atmosphere (–1 °C/100 meters). The second meteorological condition, termed the "inversion" scenario, would result in somewhat elevated sound levels at distant receivers and consisted of calm conditions and a stable atmosphere (+3 °C/100 meters), also referred to as a temperature inversion. The third meteorological scenario, termed the "wind" scenario, consisted of wind speeds of 3 meters/second (approximately 6.7 mph) blowing from the predominant wind directions in the project vicinity,

namely from the north-northwest or from the southeast; this condition would increase equipment sound levels at distant receivers located downwind of the noise-producing equipment, but would simultaneously reduce sound levels at receivers located upwind of the noise sources. Although higher wind speeds are common, they were not considered for the reasons discussed previously in the section on modifications to the DEIS and FEIS analyses.

The noise impacts of the proposed project's truck traffic were determined by using the FHWA TNM. Although the TNM is better suited for modeling traffic than the ENM because it can consider acceleration up grades and from stops, the TNM does not allow the input of varying wind speeds, wind directions, or atmospheric inversion factors. Because the algorithms used in the TNM were based on reference source emission levels measured under varying meteorological conditions, the resulting predicted traffic noise levels would reflect an average of a variety of meteorological conditions.

Using the ENM and the TNM, sound levels from onsite equipment and onsite or offsite trucks were predicted at identified sensitive receptors in the project vicinity. The receptor locations used in the modeling are displayed in Figure 2 and discussed below:

R1: Represents the Lu Residence north of the Lower Site portion and would be considered a "Rural" receptor location.

R2: Represents the temple on the Lu property and would be considered a "Rural" receptor location.

R3: Represents the residence located at 14118 475th Avenue SE and would be considered a "Rural" receptor location.

R4: Represents the residence located at 47230 SE 144th Street and would be considered a "Rural" receptor location.

R5: Represents the residence at 14110 475th Avenue SE and residences farther north of the Lower Site portion and would be considered a "Rural" receptor location.

R6: Represents the future school site north of SE Middle Fork Road and would be considered a "Rural" receptor location.

R7: Represents residences in the Wood River Community and would be considered a "Residential" receptor location.

R8: Represents the Edgewick Inn and would be considered a "Commercial" receptor location.

R9: Represents residences south of the Lower Site portion and I-90 and would be considered a "Rural" receptor location.

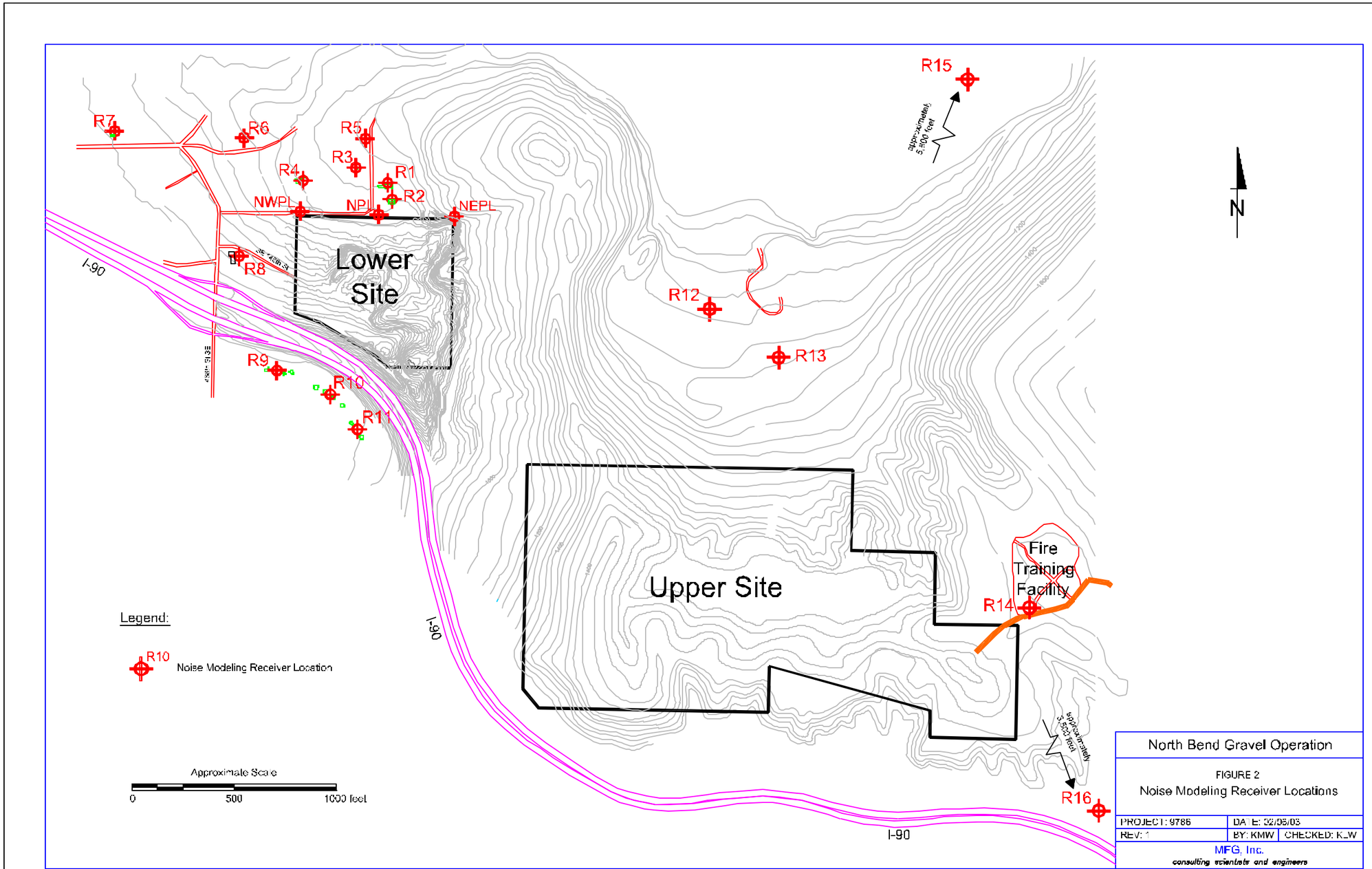

Figure 2. Noise Modeling Receptor Locations

R10: Represents residences south of the Lower Site portion and I-90 and would be considered a "Rural" receptor location.

R11: Represents residences south of the Lower Site portion and I-90 and would be considered a "Rural" receptor location.

R12: Represents the residence on the hilltop east of the Lower Site portion and would be considered a "Rural" receptor location.

R13: Represents the Lutheran Camp east of the Lower Site portion and north of the Upper Site portion and would be considered a "Rural" receptor location.

R14: Represents the Washington State Patrol Fire Training Academy east of the Upper Site portion and would be considered a "Rural" receptor location.

R15: Represents the Mine Creek Campground northeast of the Upper Site portion and would be considered a "Rural" receptor location.

R16: Represents Olallie State Park southeast of the Upper Site portion and would be considered a "Rural" receptor location.

NWPL: Represents the northwest property line location and would be considered a "Rural" receptor location.

NPL: Represents the northern property line location and would be considered a "Rural" receptor location.

NEPL: Represents the northeast property line location and would be considered a "Rural" receptor location.

3.1 Construction Impacts

3.1.1 Alternative 1–No Action

Timber harvesting under Alternative 1 could cause noise-related impacts, but it is not possible to quantify such impacts without a specific proposal. Consequently, the noise implications of this alternative were not evaluated in detail.

3.1.2 Alternatives 2 and 3–Lower and Upper Site Portions Mining (Including Limited Lower Site Portion Mining)

Phase 1 of the proposed project would involve removal of the overburden on the Lower Site portion, construction of the north and south berms around the perimeter of the processing plant area, and clearing of the conveyor alignment. This process would involve construction noise sources similar to many of the sources associated with gravel mining operations such as bulldozers and front-end loaders. However, equipment operating during the construction phase would often need to work closer to offsite locations than

during normal operation, and generally with less intervening topography to reduce the transmission of noise.

Construction noise from the Lower Site portion was modeled using the ENM assuming that two bulldozers would be at work simultaneously, one removing overburden and one clearing the conveyor pathway. A belly scraper would be working in conjunction with the dozer constructing the perimeter berms. This may be considered a conservative scenario since clearing of the conveyor pathway and subsequent construction of the conveyor would likely occur *after* construction of the northern and southern berms, not simultaneously. Sound levels of a bulldozer and a scraper are displayed with other equipment sound levels in Table 5. Predicted sound levels at offsite receptor locations are displayed in Table 6.

Table 5
Summary of Source Noise Levels (L_{eq} or L_{25}, dBA)

Equipment	Sound Pressure Level at 50 feet	Sound Power Levels
Bulldozer[a]	82	114
Scraper[a]	78	110
Front-end Loader[b]	81	113
Excavator[b]	81	113
Primary Jaw Crusher[c]	84	116
Scalping Screen [d]	83	115
Processing Plant[b]	86	117
Wash Facility[a]	84	115
Enclosed Asphalt Facility[c]	78	109
Concrete Batch Plant[b]	85	116
Conveyor[a]	63	94

Notes:

The energy levels shown are either dBA Leq or L25 derived from 1/3 octave band measurements of the equipment.

dBA - A-weighted decibels
Leq - equivalent sound level

[a] Source: Compiled from MFG equipment sound level measurement database. These levels represent source L25s.

[b] Source: Measurements taken by MFG of equipment at Cadman's Black Diamond facility. The excavator sound level is based on a measurement of a front-end loader. These levels represent source L25s.

[c] Source: Compiled from Environalysis measurements of equipment similar to that proposed for use with this project. These levels represent source Leqs.

[d] Source: Measurement taken by MFG of equipment at Cadman's Sky River facility. This level represents a source L25.

Table 6
Predicted Construction Sound Levels (Hourly L_{25}, dBA)

Receptor Location	Predicted Sound Levels			King County Limit[b]
	Calm	Inversion	Wind[a]	
Residential/Sensitive Receptor Locations				
R1 - Lu Residence	47	53	60	82
R2 - Lu Temple	49	53	61	82
R3 - 14118 475th	36	45	57	82
R4 - 47230 SE 144th	44	50	59	82
R5 - Residences Farther North	40	45	54	82
R6 - Future School	29	38	52	82
R7 - Wood River Community	24	34	45	85
R8 - Edgewick Inn	36	44	51	90
R9 - Residence South of I-90	30	37	43	82
R10 - Residence South of I-90	30	32	33	82
R11 - Residence South of I-90	28	31	35	82
R12 - Residence to East	11	14	16	82
R13 - Lutheran Camp	9	12	15	82
R14 - Fire Training Academy	0	3	9	82
R15 - Mine Creek Campground	0	6	1	82
R16 - Olallie State Park	0	0	23	82
Property Line Receptors				
NWPL - Northwest Property Line	42	47	57	82
NPL - Northern Property Line	50	54	61	82
NEPL - Northeast Property Line	53	55	55	82

Notes:
dBA - A-weighted decibels
ENM - Environmental Noise Model
L25 - sound level that is exceeded 25 percent of the time

[a] Only the highest predicted sound levels for the two wind directions modeled (NNW and SE) are displayed.
[b] The King County noise limits for large mobile construction equipment are 25 dBA above the operational noise limits during daytime hours. Daytime hours are defined as 7 a.m. to 10 p.m. weekdays, and 9 a.m. to 10 p.m. weekends and holidays.

Source: ENM calculations by MFG, Inc.

As shown in Table 6, predicted construction sound levels under all three meteorological scenarios fall well below King County's allowable construction noise limits.

3.1.3 Alternative 4–Upper Site Portion Mining - Exit 38

Construction activities under Alternative 4 would consist of preparing access roads and a processing plant area on the Upper Site portion. The noise impacts from these activities would be minor. The removal of overburden and woody debris would be a part of ongoing mining operations on the Upper Site portion.

3.2 Operation Impacts

Noise sources associated with the three mining alternatives could include the following:

- A front-end loader, bulldozer, and/or excavator used to extract sand and gravel from the mining area and feed the primary jaw crusher. This equipment would generally work near the base of the mining face.
- A primary jaw crusher and a screen working in conjunction with the excavating equipment near the active mining face.
- A processing plant incorporating crushers, screens, and conveyors.
- A wash plant.
- A front-end loader operating in the vicinity of the processing plant.

Trucks transporting material off site and returning to the site. Noise sources associated only with specific alternatives include the following:

Alternative 2 Only

- A conveyor used to transport material from the Upper Site portion to the Lower Site portion

Alternatives 2 and 3

- An enclosed asphalt plant
- A concrete batch plant
- Associated concrete and asphalt trucks transporting material offsite

Equipment sound level information, including 1/3 octave band data, was compiled from the previous DEIS and FEIS analyses and from other noise studies. The measured noise levels and frequency content of the equipment were used in the prediction of future noise levels resulting from mining

activities. Table 5 summarizes the sound levels used in the noise evaluation.

Because the noise from a gravel operation is typically fairly constant over the course of an hour, the noise standard that would be most limiting would be the hourly L_{25} limit. In order to more closely relate the modeled sound levels with the County's noise limits, the measured L_{25} of each source was used when this information was available. However, not all of the equipment sound level information was available as an L_{25}. Because the noise generated by gravel operations tends to be fairly continuous over the course of an hour, the sound levels of these operations described by the L_{eq} and L_{25} would be very similar (within 1 to 2 dBA) and the L_{eq} is used to represent an L_{25}.

The assumptions made in the modeling process were deliberately intended to represent potential worst-case noise exposure. They included specifying several equipment locations within the proposed Upper and Lower Site portions in each modeling run and choosing only the loudest sound level for each equipment location/receptor location combination.

As discussed previously, noise from onsite excavation and processing equipment was modeled using the source sound levels shown in Table 6 and the ENM.

Onsite and offsite truck traffic noise was modeled using the TNM. Traffic speeds used in the TNM predictions of traffic noise for the various alternatives included 70 mph for cars on I-90, 65 mph for trucks on I-90, 25 mph for all vehicles on 468th Avenue SE and SE 146th Street, 45 mph on the roadway through Olallie State Park, 20 mph on SE Grouse Ridge Road to the Upper Site portion, and 15 mph on both the Upper and Lower Site portions.

Noise from onsite excavation and processing equipment and from onsite truck traffic was added together to present potential noise levels from proposed future actions. Because the TNM estimates hourly average sound levels (L_{eq}s) instead of L_{25}s in predicting truck and automobile noise, these L_{eq}s were used in lieu of L_{25}s in approximating the overall L_{25} due to on-site activities.

The potential for project-related truck traffic causing earth-borne vibration was considered using the methodology developed for the Federal Transit Administration (FTA) in their handbook *Transit Noise and Vibration Impact Assessment*. The handbook provides a screening procedure to determine potential vibration impacts from projects involving rubber-tire vehicles. The following three screening factors are used to determine if further consideration of vibration impacts are warranted:

1. Will there be expansion joints, speed bumps, or other design features that result in unevenness in the road surface near vibration-sensitive buildings?

2. Will buses, trucks or other heavy vehicles be operating close to a sensitive building? Research using electron microscopes and manufacturing of computer chips are examples of vibration sensitive activities.

3. Does the project include operation of vehicles inside or directly underneath buildings that are vibration sensitive?

None of the previous factors are included in the proposed project. Therefore, there is little potential for project-related vibration impacts, and no further analysis is warranted.

3.2.1 Alternative 1–No Action

Timber harvesting under Alternative 1 could cause noise-related impacts, but it is not possible to quantify such impacts without specific proposals.

3.2.2 Alternative 2–Proposal: Lower and Upper Site Portions Mining (Including Limited Lower Site Portion Mining)

Noise From Onsite Activities (Alternative 2)

Potential noise impacts associated with Alternative 2 were assessed for both Phase 2 and Phase 8 to identify possible impacts from a range of operations. Phase 2 represents sound levels when there would be less equipment working on the Lower Site portion, but at a higher elevation with less intervening topography. Phase 8 represents sound levels when both the Upper and Lower Site portions would be expected to be in full operation.

Modeling for Phase 2 assumed that a loader, primary jaw crusher, and a screen were excavating material near the eastern end of the Lower Site portion at an elevation of approximately 675 feet. An additional loader was also assumed to be operating on the Lower Site portion filling trucks for offsite transport. Under this scenario, 30 trucks would enter the site and 46 would exit the site in the peak hour.

During Phase 8, equipment would be in operation on both the Upper and Lower Site portions, as described below.

On the Lower Site portion, the analysis assumed the operation of a processing plant and a wash plant with an associated front-end loader, an asphalt plant and a concrete batch plant with an associated loader, and an excavator or loader working near the conveyor surge pile. During Phase 8, 30 trucks are expected to enter the Lower Site portion during the morning peak hour and 68 trucks are assumed to exit the Lower Site portion.

On the Upper Site portion, the analysis assumed the operation of a bulldozer, front-end loader, excavator, primary jaw crusher, and screen excavating materials and transferring the material to the conveyor.

In addition to equipment on the Upper and Lower Site portions, the analysis of this alternative included a conveyor transporting material between the Upper and Lower Site portions.

Some of the proposed activities, such as trucking and the startup of the processing, asphalt, and concrete plants on the Lower Site portion could occur between 5 and 7 a.m., during the time period defined as "night" under the King County Noise Ordinance. This analysis assumed that Lower Site portion operations could begin at 5 a.m. and that the conveyor and Upper Site portion operations would begin at 7 a.m. Table 7 summarizes the modeling results for the three meteorological conditions considered.

Table 7
Predicted Sound Levels With Alternative 2 (Hourly L_{eq}/L_{25}, dBA)
All Onsite Equipment and Trucks

Receptor Location	Phase 2			Phase 8			King County Limits
	Calm	Inversion	Wind[a]	Calm	Inversion	Wind[a]	
Residential/Sensitive Receptor Locations							
R1 - Lu Residence	42/42	43/43	51/**51**	41/41	43/42	52/**51**	57/47
R2 - Lu Temple	42/42	43/43	51/**51**	42/41	43/42	51/**49**	57/47
R3 - 14118 475th	40/40	41/41	46/46	41/40	43/42	53/**52**	57/47
R4 - 47230 SE 144th	45/45	46/46	53/**53**	48/**48**	48/**48**	57/**56**	57/47
R5 - Residences Farther North	37/37	39/39	51/51	38/38	40/39	54/**53**	57/47
R6 - Future School	38/38	39/39	45/45	39/39	40/40	50/**49**	57/47
R7 - Wood River	30/30	32/32	43/43	35/31	37/35	47/**51**	60/50
R8 - Edgewick Inn	49/49	51/51	55/55	50/50	51/51	59/58	65/65
R9 - Residence South of I-90	35/35	36/36	39/39	36/35	39/37	42/39	57/47
R10 - Residence South of I-90	34/34	36/36	37/37	36/35	39/37	41/38	57/47
R11 - Residence South of I-90	32/32	35/35	39/39	35/34	38/36	41/40	57/47
R12 - Residence to East	15/15	18/18	20/20	22/16	25/19	28/20	57/47
R13 - Lutheran Camp	13/13	16/16	18/18	22/14	25/17	27/19	57/47
R14 - Fire Training Academy	8/8	11/11	16/16	40/7	42/9	40/15	57/47
R15 - Mine Creek Campground	15/15	15/15	15/15	17/15	22/16	27/16	57/47
R16 - Olallie State Park	2/2	4/4	29/29	17/3	26/5	39/30	57/47

Table 7 (Continued)
Predicted Sound Levels With Alternative 2 (Hourly Leq/L25, dBA)
All Onsite Equipment and Trucks

Receptor Location	Phase 2			Phase 8			King County Limits
	Calm	Inversion	Wind[a]	Calm	Inversion	Wind[a]	
Property Line Receptor Locations							
NWPL - Northwest Property Line	48/**48**	48/**48**	56/**56**	48/**48**	50/**49**	**62**/**61**	57/47
NPL - Northern Property Line	44/44	45/45	55/**55**	45/44	46/46	56/**55**	57/47
NEPL - Northeast Property Line	47/47	49/**49**	50/**50**	49/**49**	53/**53**	55/**54**	57/47
Exceeding King County Limits	0/1	0/2	0/7	0/3	0/3	1/10	

Notes:
Sound levels are displayed as day/night, with nighttime hours assumed for early morning operations between 5 and 7 a.m.
Shaded text indicates predicted sound levels that exceed the King County limits.

dBA - A-weighted decibels
ENM - Environmental Noise Model
L25 - sound level that is exceeded 25 percent of the time
Leq - equivalent sound level
TNM - Transportation Noise Model

[a] Only the highest predicted sound levels for the two wind directions modeled (NNW and SE) are displayed.

Source: ENM and TNM calculations by MFG, Inc.

During activities in Phase 2, the predicted noise levels would meet King County's daytime noise limits at all receptor locations. During nighttime operations (i.e., between 5 and 7 a.m.), the predicted sound levels would exceed the County noise limits at one, two, and seven receptor locations north of the pit, under the calm, inversion, and wind scenarios, respectively. Under the calm and inversion scenarios, the levels at receptor locations north of the site are dominated by truck noise, whereas onsite processing activities dominate the predicted sound levels under the wind scenario. If truck volumes between 5 and 7 a.m. were expected to be substantially lower than volumes after 7 a.m., levels would be lower than the predicted levels shown in Table 7.

During activities in Phase 8, the predicted sound levels meet King County's daytime noise limits at all receptor locations under the calm and inversion scenarios. Predicted sound levels under the wind scenario indicate a potential to exceed the daytime limits at the northwest property line location. Because this location does not include a sensitive receiver, no noise impact would be anticipated. Also, because the modeled wind conditions are unlikely to occur in a coherent fashion over an hour (i.e., same speed and direction), the modeled sound levels under the "wind" scenario would likely fluctuate over time and may not exceed the daytime noise limit for the requisite period of time considered by the King County Code.

During nighttime operations (i.e., between 5 and 7 a.m.), the predicted sound levels exceed the County noise limits at 3, 3, and 10 receptor locations under the calm, inversion, and wind scenarios (Table 7), respectively. Under the calm and inversion scenarios, the sound levels are

dominated by truck noise, whereas onsite processing activities dominate the predicted sound levels under the wind scenario.

Noise from Offsite Truck Traffic (Alternative 2)

The updated noise analysis predicted offsite traffic noise with and without the project in the year 2025 only. Since the overall traffic volumes in the project vicinity would be greater in 2025 than in earlier years, predicted traffic noise levels in 2025 would be higher than in earlier years and would represent a reasonable worst-case scenario for considering noise impacts from both project and nonproject traffic. Potential *increases* in traffic noise would not be a factor in determining impacts at receptor locations potentially affected by offsite traffic noise, namely the Edgewick Inn, the Washington State Patrol Fire Academy, and Olallie State Park. None of these locations include permanent residents who would be affected by a long-term project-related increase in noise. At each of these locations, the overall sound level is used to determine potential noise impacts, and traffic in the year 2025 represents a reasonable worst-case scenario.

Noise from offsite truck traffic may cause noise impacts at some locations very near access roads to the site. Offsite traffic noise levels were predicted using the TNM at the same sensitive locations for which onsite equipment was predicted using the ENM (Table 8). Predicted offsite traffic noise levels in 2025 with the proposed project in peak production were compared to predicted sound levels in 2025 without the project in order to gauge the potential noise impact caused by the project.

With Alternative 2, it is apparent that project-related offsite truck traffic would result in relatively small increases in overall traffic noise levels (i.e., 0- to 1-dBA increases would not be discernible) at most offsite locations. Most of these receptor locations are located far from the offsite roadways and nonproject traffic noise sources would continue to dominate the sound levels in the future. The only receptor location expected to experience noticeable increases in noise due to traffic related to Alternative 2 is the Edgewick Inn.

The predicted exterior sound level in 2025 at the rooms of the Edgewick Inn nearest SE 146th Street (i.e., the northern rooms) is 72 dBA. Alternative 2 would result in a 4-dBA increase over the predicted level in 2025 with no project, which would be discernible. Although the project-related increases are useful in identifying the potential for noise impacts at the Edgewick Inn, the actual *increases* are irrelevant for defining impacts at this location. This is due to the short-term use of the inn rooms by an impermanent clientele. The clientele would not otherwise be exposed to baseline traffic sound levels and, therefore, would not be impacted by an *increase* due to the project.

Patrons of the Edgewick Inn may, however, be impacted by noise if project-related truck noise causes unduly high overall sound levels. The FHWA criteria used for highway projects (see Table 2), and therefore not specifically applicable here, specify a sound level of 67 dBA for exterior locations. The predicted exterior traffic sound level of 72 dBA at the northern rooms, due to

a combination of both project and nonproject traffic, exceeds this limit and would be considered a traffic noise impact. However, this criterion is applied only to *exterior* uses and the primary use of the northern rooms at the Edgewick Inn occurs at *interior* locations. The FHWA criteria specify an *interior* sound level (hourly L_{eq}) of 52 dBA. However, the FHWA levels are set with the assumption that they are occurring during a peak traffic hour and that levels during nighttime sleeping hours would be lower than those during the peak. Therefore, this limit would not be protective of the primary use of the rooms, specifically sleeping, and an interior sound level limit of 45 dBA is suggested to reduce the potential for sleep disturbance. The 45-dBA interior noise limit is used in this analysis for determining potential noise impacts at the Edgewick Inn.

Table 8
Predicted Offsite Traffic Sound Levels (Hourly L_{eq}, dBA) in 2025

Receiver	Existing	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Residential/Sensitive Receptor Locations					
R1 - Lu Residence	54	56	57	57	56
R2 - Lu Temple	54	56	57	58	57
R3 - 14118 475th	54	56	57	58	57
R4 - 47230 SE 144th	57	59	60	60	60
R5 - Residences Farther North	53	55	56	56	56
R6 - Future School	55	57	58	58	58
R7 - Wood River Community	57	60	60	60	60
R8 - Edgewick Inn, SLM8	61	64	67	65	64
North Rooms facing 146th	65	68	72	69	68
R9 - Residence South of I-90	60	62	62	63	63
R10 - Residence South of I-90	59	62	62	62	62
R11 - Residence South of I-90	59	61	61	62	62
R12 - Residence to East	12	15	15	19	19
R13 - Lutheran Camp	12	15	15	19	19
R14 - Fire Training Academy	32	34	34	67	68
R15 - Mine Creek Campground	33	36	36	36	36
R16 - Olallie State Park	54	56	56	63	63
Property Line Receptor Locations					
NWPL - Northwest Property Line	59	61	62	62	61
NPL - Northern Property Line	55	58	59	59	58
NEPL - Northeast Property Line	56	58	58	58	58

Source: TNM calculations by MFG, Inc.

The predicted exterior traffic sound level in the four rooms at the northern end of the Edgewick Inn nearest to SE 146th Street is 72 dBA under full operation of the Lower Site portion in 2025. These predicted traffic noise levels are based on all projected traffic on local roadways. The traffic data provided for the traffic noise analysis included numerous nonproject trucks on SE 146th Street, where few large trucks currently travel. If the projected nonproject truck traffic volumes on SE 146th Street were actually lower than the traffic predictions indicate, then the offsite traffic sound levels at

the northern rooms of the Edgewick Inn would likely be somewhat lower than 72 dBA. Nevertheless, using the predicted traffic noise levels of 72 dBA in 2025 with Alternative 2, a 27-dBA reduction in the predicted exterior sound levels would be needed to achieve an interior noise level of 45 dBA.

To determine the interior noise reduction in the northernmost rooms, measurements were taken of an empty gravel truck traveling both eastbound and westbound on SE 146th Street on February 4, 2003. In the westbound direction, the truck was traveling down a low grade and slowing to a stop at the intersection of SE 146th Street and 468th Avenue SE. The measured interior sound level reductions of five westbound trips indicated an average reduction of 26 dBA with the sliding glass doors closed. In the eastbound direction, the truck was accelerating up a slight grade from a slow speed required to negotiate the turn onto SE 146th Street. The eastbound events were noticeably louder than the westbound events, and the measured interior reduction from four eastbound events averaged 29 dBA. Overall, the interior sound levels from all eastbound and westbound trips averaged 27.1 dBA with the sliding glass doors kept closed. This indicates that the exterior walls and glass doors of the Edgewick Inn appear to be sufficient to reduce the predicted 72 dBA sound levels in the future to meet an interior sound limit of 45 dBA, and there is little potential for significant noise impacts in the most affected rooms of the Edgewick Inn. Even so, the individual events are noticeable at interior locations, particularly in the lower frequencies of 50 and 63 hertz (Hz). More details of the exterior to interior sound level measurements are provided in Appendix A.

3.2.3 Alternative 3–Lower and Upper Site Portions Mining (Including Limited Lower Site Portion Mining)

Noise From Onsite Activities (Alternative 3)

Phase 2 of Alternative 3 would involve the same equipment and activities as Phase 2 of Alternative 2. Thus the noise implications would be the same as those indicated for Alternative 2.

Phase 8 of Alternative 3 would be very similar to Phase 8 of Alternative 2, except that the processing and wash plants and associated front-end loader would be located on the Upper Site portion, not the Lower Site portion, and material would be trucked from the Upper Site portion to either the Lower Site portion or to other offsite locations. The conveyor would not be used for material transport. Table 9 summarizes the modeling results for the three meteorological conditions considered.

With Alternative 3, the predicted noise levels meet King County's daytime noise limits at all receptor locations under the calm and inversion scenarios. The predicted daytime sound levels under the wind scenario indicate a potential to exceed the daytime noise limit at the northwest property line.

During nighttime operations (i.e., between 5 and 7 a.m.), the predicted levels exceed the County noise limits at four receptor locations north of the site under the wind scenario.

Table 9
Predicted Sound Levels With Alternative 3 (Hourly L_{eq}/L_{25}, dBA)
All Onsite Equipment and Trucks

Receptor Location	All Onsite Equipment			King County Limits
	Calm	Inversion	Wind[a]	
Residential/Sensitive Receptor Locations				
R1 - Lu Residence	37/37	39/39	47/45	57/47
R2 - Lu Temple	38/38	39/39	46/43	57/47
R3 - 14118 475th	37/37	39/39	49/**49**	57/47
R4 - 47230 SE 144th	43/43	44/44	51/**49**	57/47
R5 - Residences Farther North	34/34	36/35	46/41	57/47
R6 - Future School	35/35	36/36	48/47	57/47
R7 - Wood River Community	27/27	31/31	49/49	60/50
R8 - Edgewick Inn	45/45	45/45	45/45	65/65
R9 - Residence South of I-90	33/33	35/35	39/36	57/47
R10 - Residence South of I-90	33/33	35/35	38/37	57/47
R11 - Residence South of I-90	32/31	34/34	38/38	57/47
R12 - Residence to East	23/14	25/16	28/18	57/47
R13 - Lutheran Camp	23/12	25/14	28/16	57/47
R14 - Fire Training Academy	50/7	50/8	50/**14**	57/47
R15 - Mine Creek Campground	18/16	22/16	27/16	57/47
R16 - Olallie State Park	22/4	27/5	39/27	57/47
Property Line Receptor Locations				
NWPL - Northwest Property Line	44/44	46/46	**58**/**58**	57/47
NPL - Northern Property Line	41/41	43/43	49/**48**	57/47
NEPL - Northeast Property Line	42/42	46/46	45/45	57/47
Exceeding King County Limits	0/0	0/0	1/4	

Notes:
Sound levels are displayed as day/night, with nighttime hours assumed for early morning operations between 5 and 7 a.m.
Shaded text indicates predicted sound levels that exceed the King County limits.

dBA - A-weighted decibels
ENM - Environmental Noise Model
L25 - sound level that is exceeded 25 percent of the time
Leq - equivalent sound level
TNM - Transportation Noise Model

[a] Only the highest predicted sound levels for the two wind directions modeled (NNW and SE) are displayed.

Source: ENM and TNM calculations by MFG, Inc.

Noise From Offsite Truck Traffic (Alternative 3)

Under Alternative 3, predicted increases in offsite traffic noise levels due to the proposed project are negligible (less than or equal to 2 dBA) at all receptor locations except the Fire Training Academy and Olallie State Park and R12 and R13, north of the Upper Site portion. Because the predicted traffic noise levels at R12 and R13 are very low (below 20 dBA), no impact from offsite traffic noise would be expected at these locations (see Table 8).

At the Fire Training Academy, the predicted offsite traffic noise level with Alternative 3 is 67 dBA. Similar to the Edgewick Inn, there are no permanent residents or users at the Fire Training Academy. The students of the academy would not be exposed to baseline traffic sound levels and, therefore, would not be "impacted" by an increase due to the project. Therefore, the predicted *increase* in traffic noise due to the project is irrelevant for defining impacts at this location. Also, because the predicted existing traffic sound levels do not adequately represent the overall existing sound environment, the predicted increase shown in Table 8 is somewhat overstated. Users of the academy may, however, be impacted by noise if project-related truck noise causes unduly high sound levels affecting the use of the academy. Because the Upper Site portion would not operate prior to 7 a.m., sleep disturbance would not be likely. After 7 a.m., the Fire Training Academy is used for instruction, which could be affected by the proposed project. The FHWA noise criteria for highway projects specify a peak-traffic hour noise limit of 67 dBA for residences and schools. Although this criterion does not apply to this project, it provides a reasonable means by which to gauge potential noise impacts from traffic traveling on public roadways. Using the FHWA criterion for schools, the predicted sound level of 67 dBA from project-related offsite traffic would be considered a significant noise impact at the Fire Training Academy.

The predicted sound level at Olallie State Park with Alternative 3 is 63 dBA, a predicted increase of 7 dBA due to the project. Again, there are no permanent residents or users at the park, and any predicted increase in noise is irrelevant for defining impacts at this location. Users of the park may, however, be impacted by noise if project-related truck noise causes unduly high sound levels affecting the use of the park. The FHWA noise criterion for parks is 67 dBA. Because the predicted sound level of 63 dBA at Olallie State Park falls well below the FHWA noise limit for parks, no significant noise impact from offsite traffic would be anticipated.

3.2.4 Alternative 4–Upper Site Portion Mining - Exit 38

Noise From Onsite Activities (Alternative 4)

Alternative 4 would include no operations on the Lower Site portion. All excavation and processing activities would occur on the Upper Site portion. Upper Site portion activities would include excavation using a loader,

bulldozer, excavator, primary jaw crusher and screen, and a processing and wash plant with associated loader. Also, approximately 37 trucks would enter the site and 56 trucks would exit the site during the peak hour. Operations under this alternative would be restricted to between 7 a.m. and 10 p.m. Predicted future operational noise levels associated with Alternative 4 are displayed in Table 10.

Table 10
Predicted Sound Levels With Alternative 4 (Hourly L_{eq}/L_{25}, dBA)
All Onsite Equipment and Trucks

Receptor Location	All Onsite Equipment			King County Limits
	Calm	Inversion	Wind[a]	
Residential/Sensitive Location				
R1 - Lu Residence	14	19	44	57
R2 - Lu Temple	15	19	42	57
R3 - 14118 475th	13	18	39	57
R4 - 47230 SE 144th	15	20	44	57
R5 - Residences Farther North	14	20	44	57
R6 - Future School	11	15	38	57
R7 - Wood River Community	9	13	32	60
R8 - Edgewick Inn	14	17	36	65
R9 - Residence South of I-90	20	20	35	57
R10 - Residence South of I-90	20	21	37	57
R11 - Residence South of I-90	21	22	37	57
R12 - Residence to East	22	24	28	57
R13 - Lutheran Camp	23	25	28	57
R14 - Fire Training Center	50	50	50	57
R15 - Mine Creek Campground	17	22	27	57
R16 - Olallie State Park	21	27	38	57
Property Line Location				
NWPL - Northwest Property Line	12	16	39	57
NPL - Northern Property Line	14	18	40	57
NEPL - Northeast Property Line	17	20	34	57
Exceeding King County Limits	0	0	0	

Notes:
dBA - A-weighted decibels
ENM - Environmental Noise Model
L25 - sound level that is exceeded 25 percent of the time
Leq - equivalent sound level
TNM - Transportation Noise Model

[a] Only the highest predicted sound levels for the two wind directions modeled (NNW and SE) are displayed.

Source: ENM and TNM calculations by MFG, Inc.

Under Alternative 4, the predicted project-related noise levels at any receiver would not exceed the standards set out in the King County Noise Code for

daytime hours (i.e., 7 a.m. to 10 p.m.) under either the calm, inversion, or wind scenarios.

Noise From Offsite Truck Traffic (Alternative 4)

Potential impacts from offsite traffic noise with Alternative 4 (Table 8) would be virtually identical to the levels discussed for Alternative 3 at the most potentially affected locations. In summary, the project-related traffic noise levels at both the Fire Training Academy and Olallie State Park would be expected to be clearly discernible. The predicted overall traffic sound level of 68 dBA at the Fire Training Academy would exceed the FHWA criteria for schools and would be considered a significant noise impact. The predicted overall traffic sound level of 63 dBA at Olallie State Park would fall below the noise limit of 67 dBA considered an impact by FHWA, and no significant noise impacts are anticipated at the park. Again, although these criteria do not apply to this project, they are a reasonable means by which to gauge potential noise impacts from traffic traveling on public roadways.

3.3 Cumulative Impacts

Cumulative noise with any of the project alternatives is the sum of the project noise (both from onsite equipment and offsite traffic) and the projected future background sound levels. The future background sound levels are assumed to be similar to the modeled traffic sound levels under the No Action alternative is clear that the model is underpredicting the background levels at specific locations. In these cases, a measured existing sound level was used in lieu of the modeled traffic sound level. Table 11 summarizes the cumulative sound levels and the projected increases due to the peak production in 2025 under calm meteorological conditions. Please note that Table 11 includes only those locations considered to be sensitive receivers, not property line locations where no sensitive use occurs.

As shown in Table 11, cumulative sound levels would increase by a discernible amount (i.e., 3 or more dBA) at the Edgewick Inn under Alternative 2 and at the Fire Training Academy and Olallie State Park under Alternatives 3 and 4.

The predicted increase of 4 dBA at the Edgewick Inn would be expected to result in few complaints if the increase were gradual (EPA Region X EIS guidelines, April 1973) and no significant noise impact would be expected. This determination presupposes that a permanent resident or frequent user would be exposed to this predicted noise increase, which is unlikely given the impermanent residency of patrons of the Edgewick Inn.

Table 11
Predicted Cumulative Sound Levels (Hourly L_{eq}/L_{25}, dBA)
Peak Production 2025

Receptor Location	Existing Measured Sound Levels [a]	Existing Modeled Sound Levels	2025 No Action (Background) [b]	Total Project Noise (All Onsite Equipment and Trucks Plus All Offsite Traffic) Alternative 2		Total Project Noise (All Onsite Equipment and Trucks Plus All Offsite Traffic) Alternative 3		Total Project Noise (All Onsite Equipment and Trucks Plus All Offsite Traffic) Alternative 4	
				All	Increase	All	Increase	All	Increase
R1 - Lu Residence	47-55	54	56	57	1	57	1	56	0
R2 - Lu Temple	47-55	54	56	57	1	58	1	57	0
R3 - 14118 475th	47-55	54	56	58	2	58	1	57	0
R4 - 47230 SE 144th	47-57	57	59	60	1	60	1	60	0
R5 - Residences Farther North	41-53	53	55	56	1	56	1	56	0
R6 - Future School	50-57	55	57	58	1	58	1	58	0
R7 - Wood River Community	49-56	57	60	60	0	60	0	60	0
R8 - Edgewick Inn	55-61	61	64	67	4	65	1	64	0
North End of Edgewick Inn	55-61	65	68	72	4	69	1	68	0
R9 - Residence South of I-90	NA	60	62	62	0	63	1	63	1
R10 - Residence South of I-90	NA	59	62	62	0	62	1	62	0
R11 - Residence South of I-90	NA	59	61	61	0	62	1	62	0
R12 - Residence to East	44-53	12	53 [c]	23	0	24	0	24	0
R13 - Lutheran Camp	NA	13	53 [c]	23	0	25	0	24	0
R14 - Fire Training Academy	NA	31	53 [c]	41	0	67	13	68	14
R15 - Mine Creek Campground	NA	33	36	36	0	36	0	36	0
R16 - Olallie State Park	56	54	56	56	0	63	7	63	7

Notes:
dBA - A-weighted decibels
L25 - sound level that is exceeded 25 percent of the time
Leq - equivalent sound level
SLM - sound level measurement
TNM - Transportation Noise Model

Apparent discrepancies in the calculated increases are due to rounding of the levels to whole numbers.
[a] The range of measured sound levels during daytime hours (7 a.m. to 10 p.m.)
[b] 2025 background sound levels are generally based on the modeled offsite traffic noise levels for the 2025 No Action alternative.
[c] The modeled TNM sound levels do not adequately represent the 2025 background sound levels at these locations. Therefore, the measured existing sound levels were used in lieu of the modeled TNM traffic noise levels. The measured sound levels at the Lutheran Camp and the Fire Training Academy were assumed to be similar to the sound levels measured at the relatively remote SLM5 location.

The predicted increase of 7 dBA at Olallie State Park would be expected to result in more complaints using the EPA guidelines, especially if the noise occurs during sleeping hours. This determination presupposes that a permanent resident would be exposed to this predicted noise increase, which is unlikely given the nonresidential use of Olallie State Park. Also, according to the guidelines complaints would be more likely if the noise affected sleep. Since the project-related traffic noise expected to impact the park would only occur after 7 a.m., and since the park is restricted to daytime activities, any conflict with sleep would be unlikely. Because of this and because of the lack of permanent residents at the park, the predicted increases would not be anticipated to result in a significant noise impact.

The predicted increases of 13 to 14 dBA at the Fire Training Academy with Alternatives 3 and 4 would be expected to generate a substantial number of complaints using the EPA Region X guidelines. Again, this determination presupposes that a permanent resident would be exposed to this predicted noise increase, which is unlikely at the academy given the impermanent residency of students at the academy. Because of the lack of permanent residents at this facility, the *increases* would not be anticipated to result in a significant noise impact. However, the predicted overall sound levels of 67 and 68 dBA with Alternatives 3 and 4, respectively, could result in significant noise impacts at the academy.

4.0 Mitigation Measures

4.1 Alternative 1–No Action

No noise-related mitigation measures would be required under Alternative 1. Noise from timber harvesting could be loud at times but would be of short duration.

4.2 Alternative 2 (Including Limited Lower Site Portion Mining)

Noise modeling for Alternative 2 identified several receptor locations where onsite noise could exceed the King County noise limits, particularly during early morning operations between 5 and 7 a.m. Therefore, noise mitigation measures should be considered for operations during Alternative 2.

Mitigation measures could include some or all of the following:

- Restrict construction activities to between 7 a.m. and 10 p.m. on weekdays and between 9 a.m. and 10 p.m. on weekends.

- Construct berms and pave onsite access roads prior to exporting any material from the site.

- The primary crusher should be restricted from use at the Lower Site until the final grade depth is reached or a minimum depth of 20 feet is reached.

- Replace metal screens with rubber screens where possible on the scalping screen and processing plant.

- Install resilient material on the walls of metal hoppers for the primary jaw crusher, processing plant, asphalt plant, and concrete batch plant, if feasible.

- Install additional portable noise barriers around the noisiest elements of the primary jaw crusher or processing plant, if feasible.

- Orient the asphalt plant so that the truck entrances face east and west and the exhaust fan is on the south side of the building. The ENM noise modeling used only the loudest direction of the asphalt plant when predicting offsite sound levels; therefore, orienting the plant such that the quietest side faces the most impacted residential locations north of the site could result in lower sound levels than those predicted at these locations.

- Orient the concrete batch plant so that concrete trucks revving their engines to mix their loads could do this on the south side of a tall barrier or enclosure.

- Maintain a 25 mph speed limit on SE 146th Street between 468th Avenue SE and the Lower Site portion. Smooth road surfaces should be maintained to reduce tire noise and airborne vibration.

- Implement a noise monitoring program to ensure that the operation complies with the King County noise limits during early morning and daytime operations. The noise monitoring program should also ensure that the interior noise levels in the northern rooms of the Edgewick Inn do not exceed 45 dBA. (The traffic noise modeling analysis conservatively assumed that morning peak-hour truck volumes could occur any time of the day and during early morning operations.) The applicant's approved Noise Monitoring and Compliance Program is included as Appendix B.

- Restrict onsite activities in the early morning hours between 5 and 7 a.m. unless noise monitoring indicates that nighttime noise limits can be met at the residential locations north of the Lower Site portion.

- Replace standard acoustic backup alarms on equipment anticipated to back up frequently (i.e., bulldozers and front-end loaders) with ambient-sensing backup alarms.

4.3 Alternative 3–Lower and Upper Site Portion Mining (Including Limited Lower Site Portion Mining)

The mitigation measures recommended for Alternative 2 are also recommended for Alternative 3. In addition, the noise monitoring program should include the Washington State Patrol Fire Training Academy to ensure that instruction activities are not unduly impacted by noise from trucks traveling to and from the Upper Site portion.

4.4 Alternative 4–Upper Site Portion Mining – Exit 38

The following mitigation measure is suggested for Alternative 4:

- Conduct noise monitoring at the Washington State Patrol Fire Training Academy to ensure that instruction activities are not unduly impacted by noise from trucks traveling to and from the Upper Site portion.

5.0 Significant Unavoidable Adverse Impacts

Onsite equipment with Alternatives 2 and 3 could result in sound levels exceeding the County noise limits at residential locations north of the Lower Site portion, particularly during early morning operations between 5 and 7 a.m. when stricter nighttime noise limits are in effect. If early morning activities are restricted until noise monitoring can ensure that the nighttime noise limits can be met at these locations, no significant unavoidable adverse noise impact would be anticipated.

The overall traffic noise levels predicted at the Washington State Patrol Fire Training Academy with Alternatives 3 and 4 exceed the criterion used by FHWA to define traffic noise impacts at schools. Therefore, Alternatives 3 and 4 could result in unavoidable significant adverse noise impacts at this location.

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Washington State Department of Parks and Recreation

REGIONAL

East King County Regional Water Association
Sallal Water Association
Middle Fork Well Association

COUNTY

King County Executive
King County Department of Development and Environmental Services
King County Department of Transportation – Traffic Engineering Section
King County Department of Natural Resources
Public Health – Seattle and King County
King County Office of Cultural Resources
King County East Side Fire and Rescue

CITIES

Seattle Public Utilities
Issaquah
North Bend
Sammamish

GROUPS AND ORGANIZATIONS

Cascade Gateway Foundation
Mountains to Sound Greenway
Snoqualmie Valley School District #410
Wood River Community
Vallley Camp
Sierra Club – Cascade Chapter
Woodriver Area Grouse Ridge Association

Appendix A

Detailed Sound Level Measurement Data

24-hour SLM Results

SLM1 - Near Lu Property Started on 3/17/99 at 1 pm. Located adjacent to SW corner of Lu residence			
Time	L_{eq}	L_{max}	Duration
1:00 pm	48.9	61.4	1 hour
2:00 pm	50.7	76.3	1 hour
3:00 pm	47.3	60.1	1 hour
4:00 pm	46.9	55.9	1 hour
5:00 pm	49.2	56.4	1 hour
6:00 pm	47.3	62.2	1 hour
7:00 pm	46.9	60.6	1 hour
8:00 pm	47.3	56.1	1 hour
9:00 pm	47.4	57.1	1 hour
10:00 pm	46.4	56.2	1 hour
11:00 pm	44.7	58.7	1 hour
12:00 am	44.7	54.1	1 hour
1:00 am	46.2	59.2	1 hour
2:00 am	47.4	59.8	1 hour
3:00 am	45.3	58.8	1 hour
4:00 am	47.3	56.3	1 hour
5:00 am	47.5	61.4	1 hour
6:00 am	49.3	60.4	1 hour
7:00 am	50.2	71.1	1 hour
8:00 am	51.9	61.4	1 hour
9:00 am	50.6	63.8	1 hour
10:00 am	55.3	67.6	1 hour
11:00 am	52.5	66.8	1 hour
12:00 pm	50.4	64.8	1 hour

SLM2 - Wood River Community Started on 3/17/99 at 1 pm. Located adjacent to SE corner of Wood River, approximately 95 feet north of SE Middle Fork Road.			
Time	Leq	Lmax	Duration
1:00 pm	52.3	67.3	1 hour
2:00 pm	53.8	64.8	1 hour
3:00 pm	51.7	66	1 hour
4:00 pm	48.9	59.9	1 hour
5:00 pm	50.8	66.9	1 hour
6:00 pm	51.7	62.1	1 hour
7:00 pm	51.1	71	1 hour
8:00 pm	51.4	61.5	1 hour
9:00 pm	52.1	64.4	1 hour
10:00 pm	50.7	64.5	1 hour
11:00 pm	48.6	58.7	1 hour
12:00 am	49.9	58.8	1 hour
1:00 am	49.9	60	1 hour
2:00 am	49	59.1	1 hour
3:00 am	48.4	57.5	1 hour
4:00 am	47.2	58.5	1 hour
5:00 am	45.6	57.6	1 hour
6:00 am	48.4	68.2	1 hour
7:00 am	49.4	62.7	1 hour
8:00 am	54.3	64	1 hour
9:00 am	52.5	63.9	1 hour
10:00 am	55.3	69.7	1 hour
11:00 am	55.8	68.9	1 hour
12:00 pm	54	69.5	1 hour

SLM3 - North of Site Started on 3/17/99 at 1 pm. Located on east property line of 14110 475th Avenue SE, approximately 230 feet east of south end of 475th Avenue SE			
Time	Leq	Lmax	Duration
1:00 pm	44.3	60.8	1 hour
2:00 pm	43.2	61	1 hour
3:00 pm	42.3	58.6	1 hour
4:00 pm	40.8	54.2	1 hour
5:00 pm	43	53	1 hour
6:00 pm	43.4	61.7	1 hour
7:00 pm	43.4	61.8	1 hour
8:00 pm	43.9	61.6	1 hour
9:00 pm	44.4	57.6	1 hour
10:00 pm	43.4	53.8	1 hour
11:00 pm	41	48.5	1 hour
12:00 am	40.4	48.4	1 hour
1:00 am	42.2	54.1	1 hour
2:00 am	43.1	55.1	1 hour
3:00 am	42.1	52.4	1 hour
4:00 am	43.3	50.7	1 hour
5:00 am	45.3	66.3	1 hour
6:00 am	47.1	73.1	1 hour
7:00 am	46.9	68.1	1 hour
8:00 am	53	66.3	1 hour
9:00 am	48.6	60.7	1 hour
10:00 am	52.1	70.5	1 hour
11:00 am	49.3	66	1 hour
12:00 pm	46.1	63	1 hour

SLM4 - Future School Started on 3/17/99 at 1 pm. Located on potential new school site at Lake Dorothy Road, approximately 60 feet north of and 270 feet east of SE Middle Fork Road			
Time	Leq	Lmax	Duration
1:00 pm	52.5	67.3	1 hour
2:00 pm	53.6	64.8	1 hour
3:00 pm	51.8	66	1 hour
4:00 pm	50	59.9	1 hour
5:00 pm	52.1	66.9	1 hour
6:00 pm	51.8	62.1	1 hour
7:00 pm	51.4	71	1 hour
8:00 pm	49.6	61.5	1 hour
9:00 pm	50.5	64.4	1 hour
10:00 pm	57.1	64.5	1 hour
11:00 pm	48.8	58.7	1 hour
12:00 am	49.8	58.8	1 hour
1:00 am	48.3	60	1 hour
2:00 am	48.7	59.1	1 hour
3:00 am	48.3	57.5	1 hour
4:00 am	47.6	58.5	1 hour
5:00 am	46.5	57.6	1 hour
6:00 am	50.6	68.2	1 hour
7:00 am	52.6	62.7	1 hour
8:00 am	55.9	64	1 hour
9:00 am	54.6	63.9	1 hour
10:00 am	57.2	69.7	1 hour
11:00 am	54.7	68.9	1 hour
12:00 pm	55.3	69.5	1 hour

SLM5 - Hillside East Started on 3/18/99 at 2:45 pm. Located at 49211 SE Middle Fork Road, approximately 20 feet south of and 500 feet east of Middle Fork Road in the 49200 block			
Time	L_{eq}	L_{max}	Duration
2:45 pm	52.5	65	15 min
3:00 pm	47	67.3	1 hour
4:00 pm	46.4	68.3	1 hour
5:00 pm	46.3	70.4	1 hour
6:00 pm	52	68.6	1 hour
7:00 pm	48.1	67.2	1 hour
8:00 pm	51.4	78.6	1 hour
9:00 pm	43.8	65.9	1 hour
10:00 pm	44	65.9	1 hour
11:00 pm	42.1	66.3	1 hour
12:00 am	38.6	49.2	1 hour
1:00 am	39.9	58	1 hour
2:00 am	39.4	41.8	1 hour
3:00 am	41.8	62	1 hour
4:00 am	38.5	54.7	1 hour
5:00 am	40.8	56.1	1 hour
6:00 am	46	68.9	1 hour
7:00 am	45.5	67.3	1 hour
8:00 am	51.7	74.3	1 hour
9:00 am	47.3	69.4	1 hour
10:00 am	47.2	66.4	1 hour
11:00 am	44.4	63.5	1 hour
12:00 pm	52.8	78.6	1 hour
1:00 pm	47.7	66.5	1 hour
2:00 pm	48.9	68.4	45 min

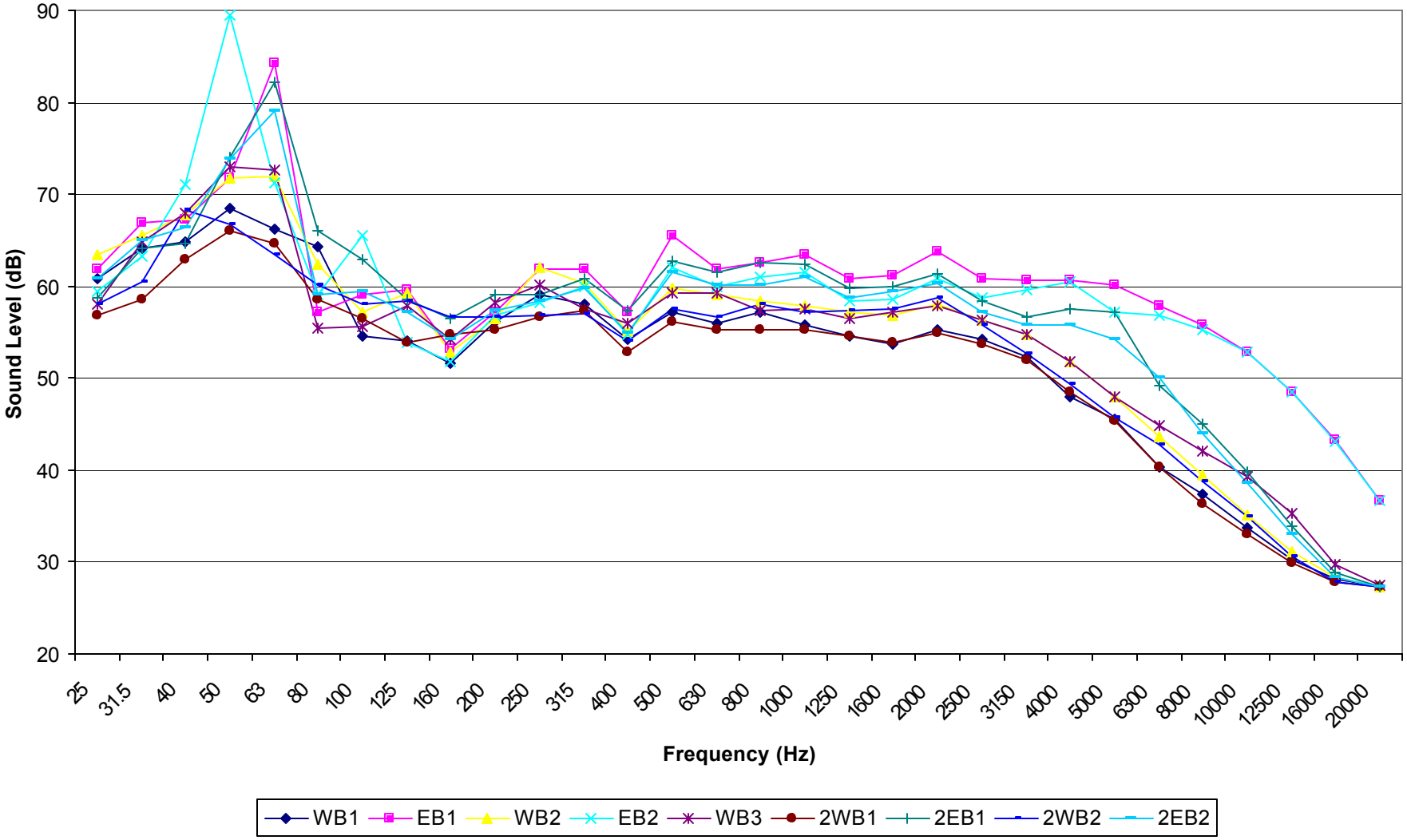
SLM6 - Lu Property Started on 3/18/99 at 2:45 pm. Same location as SLM1			
Time	L_{eq}	L_{max}	Duration
2:45 pm	52.6	64.6	15 min
3:00 pm	51.3	65.6	1 hour
4:00 pm	54.3	63.2	1 hour
5:00 pm	54.6	61.7	1 hour
6:00 pm	55.2	61.7	1 hour
7:00 pm	54.8	63	1 hour
8:00 pm	51.4	63.9	1 hour
9:00 pm	48.8	65.3	1 hour
10:00 pm	47.7	64.5	1 hour
11:00 pm	49.6	57.3	1 hour
12:00 am	48	57	1 hour
1:00 am	46.5	60.1	1 hour
2:00 am	46.9	57.9	1 hour
3:00 am	44.6	58.5	1 hour
4:00 am	45.5	54.9	1 hour
5:00 am	49.8	62.1	1 hour
6:00 am	48.4	56.4	1 hour
7:00 am	50.2	70.4	1 hour
8:00 am	50	61.5	1 hour
9:00 am	49.6	58.6	1 hour
10:00 am	49.6	63.5	1 hour
11:00 am	48.8	57.1	1 hour
12:00 pm	48.6	61.1	1 hour
1:00 pm	51.5	62.5	1 hour
2:00 pm	51.8	58.1	45 min

SLM7- Started on 3/18/99 at 2:45 pm. Located approximately 60 feet north of SE 144th Stand, 30 feet west of driveway to 47230 SE 144th			
Time	Leq	Lmax	Duration
2:45 pm	53.6	66.1	15 min
3:00 pm	52.4	62.8	1 hour
4:00 pm	55.3	64.6	1 hour
5:00 pm	55.4	64	1 hour
6:00 pm	55.9	67.5	1 hour
7:00 pm	56.6	63.4	1 hour
8:00 pm	53	65.1	1 hour
9:00 pm	50.7	60.4	1 hour
10:00 pm	49.4	64.3	1 hour
11:00 pm	50.5	56.8	1 hour
12:00 am	47.5	54.7	1 hour
1:00 am	47.2	57.8	1 hour
2:00 am	47.3	55.6	1 hour
3:00 am	45.1	57.1	1 hour
4:00 am	43.4	53.8	1 hour
5:00 am	50.3	59.5	1 hour
6:00 am	49.8	57.9	1 hour
7:00 am	47.2	66	1 hour
8:00 am	48.8	61.1	1 hour
9:00 am	49.2	58.7	1 hour
10:00 am	49.3	63.1	1 hour
11:00 am	46.9	56.3	1 hour
12:00 pm	48.2	58.4	1 hour
1:00 pm	51	64	1 hour
2:00 pm	50.8	57.8	45 min

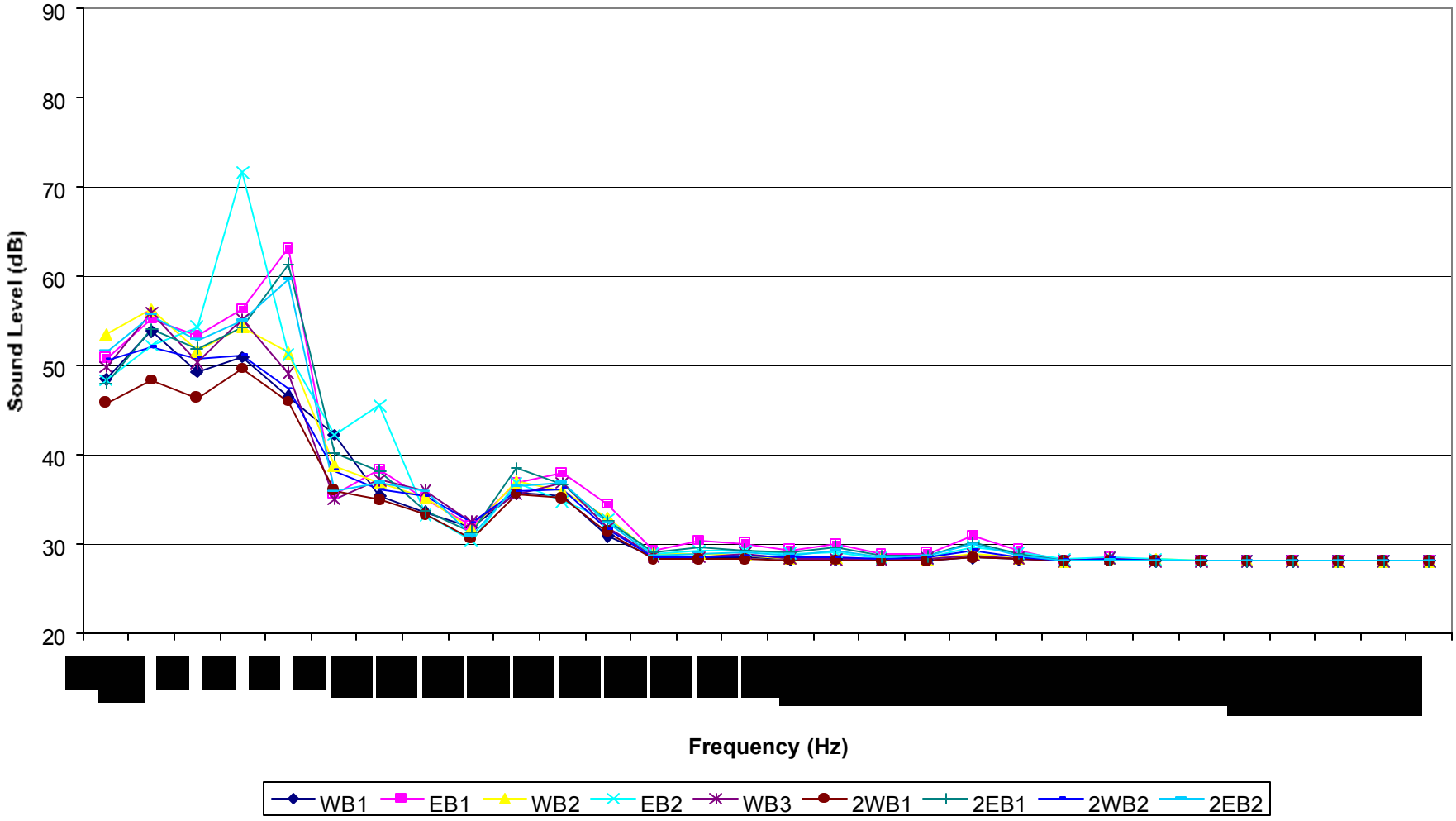
SLM8 - Edgewick Inn Started on 3/18/99 at 2:45 pm. Located near the eastern property boundary approximately 58 feet south of the edge of SE 146th St			
Time	L_{eq}	L_{max}	Duration
2:45 pm	57	66.2	15 min
3:00 pm	56.6	63.8	1 hour
4:00 pm	57.3	69.1	1 hour
5:00 pm	58.1	72.6	1 hour
6:00 pm	59.6	72.3	1 hour
7:00 pm	61	67.1	1 hour
8:00 pm	60.7	79.2	1 hour
9:00 pm	59	78.7	1 hour
10:00 pm	58.2	63.8	1 hour
11:00 pm	57.4	67.2	1 hour
12:00 am	56.9	60.5	1 hour
1:00 am	57.2	62.3	1 hour
2:00 am	57.1	65.2	1 hour
3:00 am	56.8	62	1 hour
4:00 am	56.6	61.8	1 hour
5:00 am	57.8	67.8	1 hour
6:00 am	58.9	69.1	1 hour
7:00 am	58.4	68.8	1 hour
8:00 am	57.1	64.8	1 hour
9:00 am	56.5	68.5	1 hour
10:00 am	57.8	69.3	1 hour
11:00 am	55	67.1	1 hour
12:00 pm	56.1	68.7	1 hour
1:00 pm	57.1	66.6	1 hour
2:00 pm	57	74.7	45 min

Edgewick Inn – Exterior to Interior Noise Reduction Measurements

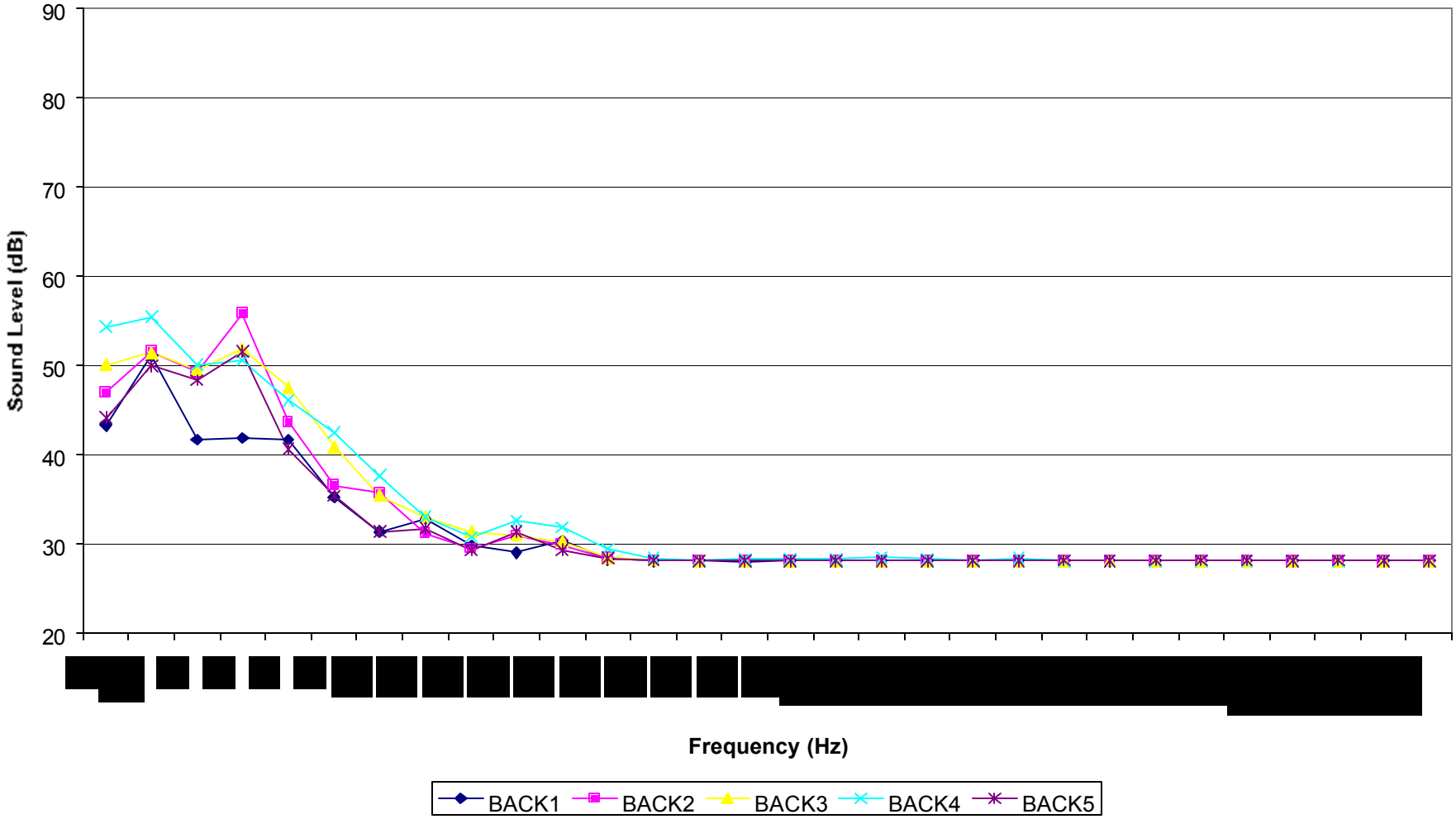
Edgewick Inn Northern Rooms
Exterior Noise Levels During Truck Passby Events
February 4, 2003



Edgewick Inn Northern Rooms
Interior Noise Levels During Truck Passby Events
February 4, 2003



Edgewick Inn Northern Rooms
Background Interior Noise Levels (No Truck Passbys)
February 4, 2003



Appendix B

King County Approved Noise Monitoring and Compliance Program

(submitted by Cadman, Inc.)

2/27/03

NOISE MONITORING AND COMPLIANCE PROGRAM

Introduction

This document defines a noise monitoring and compliance program that will be implemented to ensure that on-site operation of the Cadman North Bend (Grouse Ridge) facility is in compliance with environmental noise limits established by King County. In addition, while Cadman believes that noise from traffic on public roads is exempt from local government regulation, Cadman is voluntarily proposing to undertake a noise monitoring and reduction program at an off-site location as described in Part 1, Section 8 below to reduce noise from trucks going to and from the site on SE 146th Street. Based on Cadman's agreement, King County has approved this noise monitoring and compliance program. The program is modeled after the successful noise monitoring program established for the Cadman Black Diamond facility. The Black Diamond program has been in place for more than three years, and has consistently verified that noise levels from facility operations are at or below the levels predicted in the environmental noise analysis for the project. The program has successfully ensured that facility noise levels are within the required limits, with reports filed on a regularly scheduled basis to document and evaluate the facility operational noise levels.

This program for the North Bend facility is directed toward both on-site and off-site noise generation, and adheres to the noise control measures set forth in the project Final Environmental Impact Statement (FEIS) and in the additional noise analysis prepared by King County. The program also provides a management tool for reducing overall site noise, should monitoring show that to be necessary to achieve compliance. The program includes provisions for:

* Noise monitoring at defined periodic intervals, and in response to concerns or specific noise-generating sources;

* Reporting;

* Required corrective action.

The program is divided into two parts: (I) general provisions; and (II) periodic monitoring, reporting and corrective actions to demonstrate and ensure compliance with King County noise regulations, and in response to concerns. The program is described below.

Part I: General Provisions

1. ***Purpose:*** The intent of the noise monitoring program is to ensure that mining operations comply with County regulations and follow the noise control measures of the project FEIS and the FEIS Addendum. The program identifies the applicable regulations, allowable noise limits, monitoring and reporting requirements, and corrective action. The performance goals set forth in Part I, Section 8 establish the standards that Cadman is committing to meet.

2. ***Applicable Regulations.*** Applicable noise regulations used to determine compliance are those contained in the King County Code, Chapter 12.86 through 12.100.

3. ***Qualified Consultant:*** Cadman Inc. will retain a King-County approved, independent acoustical consultant, qualified by education and professional experience to perform and interpret noise analyses. Such consultant will be employed to measure sound levels in the vicinity of the project at unannounced times as described below, to interpret data, to suggest corrective actions should such be necessary, and to prepare the reports required by this program.

4. ***Instrumentation:*** Noise level measurements will be made using a Type I Sound Level Meter (SLM) that complies with ANSI S1.4. The microphone will be mounted on a tripod and at a height of 5 feet above the ground, and will be equipped with a suitable windscreen. The SLM will be calibrated immediately before and after the measurements. The calibration device will have been certified within the past year by a recognized standards laboratory.

5. ***Measurement Settings and Metrics*****:** The SLM will be set to the FAST response and A-weighting. Sound levels will be measured as equivalent sound levels (Leq), maximum sound level (Lmax), and the sound levels exceeded 2.5, 8.3 and 25 percent of the time (L2.5, L8.33, and L25). These metrics correspond closely to the requirements specified in the King County Noise Code (KCC Chapter 12.88.020 & 12.88.030).

6. ***Monitoring Locations:*** For periodic monitoring, noise levels will be measured at locations identified in Appendix A, Tables 2 and 3. These locations shall be deemed acceptable for noise monitoring upon approval of this plan by the appropriate governing agencies. The acoustical consultant will select specific locations for measurements based on conditions at the time of each measurement and proximity to dominant mining noise sources. The permit holder shall secure the necessary permission to use approved sites for monitoring.

   For monitoring in response to specific concerns, sound levels will be measured at the location of the noise generator(s) and/or receiver location(s) of concern.

   The date and time at which the noise measurements are to be made will not be announced to the operator of the mining facility in advance.

7. ***Reporting:*** Measurements will be documented in a report summarizing the results and describing:
   Instrumentation used in the measurements, including calibration records;

   a. Measurement locations, including a sketch;

   b. Measurement beginning time and duration at each location;

   c. The equivalent sound level (Leq), the maximum sound level (Lmax), and the sound levels exceeded 2.5, 8.3 and 25 percent of the time (L2.5, L8.33, and L25).

Compliance with the King County noise limit shall be assessed strictly by the Lmax, L2.5, L8.33 and L25 generated by on-site Cadman activity.

d. A description of the dominant noise source(s) contributing to the measured levels. Significant non-Cadman sources will also be noted;

e. A description of the process rates or level of activity at the noise source(s) as observed, including a list of equipment that is running during the measurement period;
A description of meteorological conditions during the measurement period, based on data collected at the Weather Center in North Bend and on measurements of wind speed to be collected during the measurement period. The sound level measurements and meteorological data will be correlated to the extent possible in order to identify meteorological conditions that cause exceedances of the noise criteria specified in Part I, Section 2.

8. The Edgewick Inn Monitoring and Evaluation: Cadman includes the following provisions to monitor at the Edgewick Inn for exposure to Cadman off-site truck traffic noise on SE 146th Street and potential noise control of same.

a. Exterior/Interior Noise Reduction - The exterior-to-interior noise reduction of the Edgewick Inn will be measured on the north side of the Inn, which has the highest level of noise exposure to trucks traveling on SE 146th Street to enter and leave the site. All future noise monitoring measurements will be conducted on the exterior of the building, with the measured noise reduction applied to the exterior levels to determine the interior noise level. The noise reduction will be measured in one-third octave bands, to allow evaluation of frequency-specific interior noise levels. The noise-reduction measurements can be repeated on future occasions if necessary in response to concerns or following any changes in the exterior construction of the Edgewick Inn building.

b. Existing Interior Noise Levels – Existing hourly Leq and L1 interior noise levels will be measured prior to the initial commencement of Cadman operations at the project site. The measurements will be conducted continuously for a minimum of 48 hours, scheduled to include two full workday periods. The measurements will establish baseline interior noise levels for evaluation of future interior noise levels due to Cadman operations. (The Leq and L1 metrics will provide an hourly level and reasonably sustained peak level, while avoiding the potentially misleading single-event Lmax.) The measurements are contingent upon Edgewick Inn approval, and will require the use of an unoccupied guest room on the north side of the Inn for the duration of the measurement period.

c. Measurements of Noise from Operations – Noise measurements will be conducted continuously for a one-hour period, four times per year (once every three months). The measurement location will be at the northeast corner of the Edgewick Inn, setback from SE 146th Street a distance equal to the setback of the north side of the Inn. This location corresponds generally to the SLM 8 location described in the project EIS, and represents the Edgewick Inn traffic noise exposure from SE 146th Street. The use of

this location for noise measurements will be subject to approval by the property owner. The SLM will be positioned to minimize building reflections. The measurement metrics will be Leq and L1, to correspond to the baseline measurements. The SLM will be "paused" to the extent possible during non-Cadman events such as truck pass-bys and vehicles leaving the adjacent gas station. Alternatively, 1-second Leq measurements will be conducted for one-hour measurement periods as described above, with post-measurement processing applied to the data to remove non-Cadman noise events. The noise levels will be measured in one-third octave bands, and the measured exterior noise reduction (see Section a) will be applied to the exterior levels to establish the interior noise level due to Cadman activity.

d. Noise Criteria – Noise from traffic on public roads is exempt from the noise limits of King County Code Chapter 12.88. An hourly Leq interior noise level of 45 dBA or lower shall be the criterion for measuring compliance with this noise reduction program – at the Edgewick Inn.

e. Noise Control – If the noise measurements indicate that levels due to Cadman off-site trucking operations exceed the criteria specified in Section d, off-site trucking during nighttime hours (10 p.m. to 7 a.m.) will cease until effective noise control measures have been implemented. Cadman and King County will discuss appropriate noise control measures at the Edgewick Inn site or within abutting right-of-way. Elevated noise measurements can be alleviated through the implementation of various alternative measures, such as (1) reducing the number of off-site truck trips during nighttime hours; (2) constructing a noise barrier along the south margin of the SE 146th Street right-of-way adjacent to the north side of the Edgewick Inn parking lot; and (3) increasing the sound resistance of the northside building wall through architectural modifications.

f. Cooperation with Edgewick Inn – In order to implement this effort to control noise affecting the Edgewick Inn, Cadman will require cooperation from the owners of the Edgewick Inn to perform some aspects of the noise monitoring and control activities. If the owners of the Edgewick Inn choose not to cooperate in these efforts, Cadman will use its best efforts to accomplish the goals set forth in this section by measures that can be taken completely on public property and such measures will be deemed to satisfy the goals of this section.

9. ***Phase 2 Rock Crusher Monitoring:*** Cadman will notify the acoustical consultant prior to operation of the rock crusher in Phase 2 of the project. The consultant will monitor crusher noise levels during the initial start-up and operation of the crushing equipment. The measurement will be conducted at the location identified in Appendix A, Table 2, that represents the highest level of noise exposure to the crushing equipment. If the noise level is in violation of the County Code, the crushing operation will cease until the noise is reduced to levels that comply with code limits.

Part II: Periodic Monitoring and Response to Concern Areas

Part II of the program contains directions for periodic monitoring of project-related noise levels and monitoring related to specific concerns, and to determine compliance with King County noise limits.

1. ***Monitoring Schedule, Duration and Location:***

    a. All noise measurements described below will be performed without advance notice of the operator of the mining facility, except for those requested by the operator to investigate specific issues or concerns.

    b. Measurements will be conducted four times per year (once every three months) starting prior to project startup (to obtain baseline sound levels at previously unmeasured locations) and continuing throughout the duration of the operation. Measurements will be conducted during periods with the highest levels of on-site activity for at least two of the four measurements occurring in one year.

    c. Monitoring will also be conducted if concerns are received that require further investigation. Telephone calls concerning mine operations noise should be directed to the Cadman Supervisor of Environmental Services, 425-867-1234. This element of the program will remain in effect for the life of the operation.

    d. Measurements will be taken at each location for at least 15 minutes during periods when the wind speed is not more than 12 mph nor precipitation falling in such a way as to affect the equipment or the measurement readings.

    e. At least one measurement per year will be two hours in duration, conducted at a peak activity time period during a month with a high on-site activity level. The measurement will occur at the monitoring location with the highest noise levels (based on previous monitoring).

    f. If noise level contributions from other sources not associated with on-site mining activities are encountered, such as off-site vehicular traffic, trains, helicopters or aircraft, and the measurement personnel believe these sources are affecting the measured sound levels, the SLM will be paused until these sources are gone or else the measurement will be postponed. Pauses will be noted and reported. If such noise sources are so persistent as to preclude a meaningful measurement of noise associated with the mining facility, this condition will be reported to Cadman and to King County. Alternatively, 1-second Leq measurements will be conducted for measurement periods as described above, with post-measurement processing applied to the data to remove non-Cadman noise events.

    g. The consultant will prepare a report summarizing the findings of the monitoring. The report will be provided to King County with a copy to Cadman. If the report indicates non-compliance, the provisions of this program for Corrective Action will apply.

2. ***Corrective Action:***

a. If Cadman on-site operations violate County regulations; or the noise criteria set forth in this program at Part I, paragraph 8.d., in this program, the acoustical consultant will notify King County and Cadman immediately. Within one day of receipt of notice of a violation, Cadman shall notify the County of the cause of the violation and, if known, potential solutions. Cadman shall immediately reduce or eliminate the noise source responsible for the violation(s).

b. Noise reduction measures for on-site operations may include

- equipment modification,
- changes in operational procedures,
- changes in hours of operation,
- barrier construction or modification,
- equipment enclosures, or other measures as appropriate.

c. Noise reduction measures for off-site trucks affecting the Edgewick Inn may include

- cessation of off-site trucking during nighttime hours (10 p.m. to 7 a.m.) until effective noise control measures have been implemented;
- reduction in the number of off-site truck trips during nighttime hours;
- reduction of truck speeds on SE 146th Street to 5 MPH, or as necessary for compliance with noise criteria;
- modifications to the exterior construction of the Edgewick Inn to improve the building's exterior-to-interior noise reduction. The modifications may affect the exterior walls, windows, HVAC penetrations, and patio doors;
- construction of a sound barrier along SE 146th Street on the north side of the Edgewick Inn.

d. If measurements indicate that noise levels are non-compliant with grading permit conditions, the director or his designee responsible for code compliance may also determine that civil code violations have occurred or are occurring and may initiate appropriate legal action in accordance with KCC Title 23. Response to non-compliance shall be in accordance with KCC 23.02.040.A 1-7.

e. Pursuant to a noise violation as specified in Section a. above, a follow-up noise measurement to demonstrate compliance will be conducted at the location of the violation within one week of the time Cadman notifies the acoustical consultant that the condition has been corrected.

Appendix A

The applicable limits for the noise-monitoring program are contained in the King County Code, Chapter 12.88, *Environmental Sound Levels*. The King County Code limits apply to noise produced by all on-site activities and received at residential or commercial properties. Noise from off-site traffic will be evaluated at the Edgewick Inn in accordance with Section 9 of this program. The measurement locations are those used to establish the baseline levels in the DEIS and FEIS, identified in Tables 2 and 3 below. The baseline noise levels reported in the project FEIS will be verified with additional measurements prior to start-up of Cadman activities.

The applicable King County Code noise limits for an industrial source and rural or commercial receiver are presented in Table 1. Sounds of short duration may exceed the maximum permissible sound levels in Table 1 by a total of not more than 15 minutes in any one-hour period, when comprised of one or any combination of the following:

(1) 5 dBA for a total of fifteen minutes, or (KCC 12.88.030 C.)
(2) 10 dBA for a total of five minutes, or
(3) 15 dBA for a total of one-and-one-half minutes.

Table 1
King County
Maximum Permissible Sound Levels (dBA)
Industrial Source Property

	Rural Receiving Property	Commercial Receiving Property
Weekday Daytime Hours* (7 a.m. to 10 p.m.)	57	65
Weekday Nighttime Hours (10 p.m. to 7 a.m.)	47	65

* Weekend hours for the specified allowable noise limits are 9 a.m. to 10 p.m. (daytime) & 10 p.m. to 9 a.m. (nighttime)

Truck traffic on public roads is exempt from the noise limits of King County Code Chapter 12.88. King County Code Chapter 12.90.010 establishes limits on the sound level emissions of individual vehicles.

Tables 2 and 3 present descriptions of measurement locations associated with the monitoring of noise from on-site activities, and for monitoring noise from off-site trucking operations. Monitoring locations generally correspond to locations as shown in Figure 5-1 of the project FEIS.

Table 2
Locations for Monitoring of Noise from On-Site Activities

Measurement Location	**Description**
Alternative 2	
Site 1	Adjacent to SW corner of Lu Residence, 17 feet south of SW corner S18 T23N R93
Site 4	Potential new school site at Lake Dorothy Road, 60 feet north of and 270 feet east of SE Middle Fork Road
Site 7	SE 144th Street near the NW corner of the project lower site
Site 8 – Edgewick Inn*	Northeast corner of Edgewick Inn (see Section 9, Part c)

* Use of this location for monitoring is subject to approval by the property owner

Table 3
Locations for Monitoring of Noise from Off-Site Trucking Activities

Measurement Location	**Description**
Alternative 2	
Site 8 - Edgewick Inn*	Northeast corner of Edgewick Inn (see Section 9, Part c). Baseline sound levels will be determined prior to commencement of the monitoring plan.

* Use of this location for monitoring is subject to approval by the property owner

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